

# **TM 5-3895-221-15**

**DEPARTMENT OF THE ARMY TECHNICAL MANUAL**

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**OPERATOR, ORGANIZATIONAL,  
FIELD, AND DEPOT MAINTENANCE MANUAL**

**MIXER, CONCRETE, TRAILER  
MOUNTED: GASOLINE DRIVEN;**

**16 CU FT**

**(CHAIN BELT MODEL HBG)**

**FSN 3895-835-4512**

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This copy is a reprint which includes current  
pages from Changes 1 and 4.

RETURN TO GOV. DOCS. CLERK

**HEADQUARTERS, DEPARTMENT OF THE ARMY**

**AUGUST 1962**

## **SAFETY PRECAUTIONS**

### **BEFORE OPERATION**

Do not smoke, avoid an open flame, and maintain a metal to metal contact between the fuel filling device and the fuel tank. A static spark can ignite fuel and fuel vapors.

Keep a fire extinguisher serviced and ready for use at any minute.

Avoid inhaling toxic fumes caused by the use of a fire extinguisher.

### **DURING OPERATION**

Do not troubleshoot the mixing drum while the engine is operating and the drum clutch is engaged or while the drum is rotating. Injury to any part of the body can result.

Do not lower or raise the loading skip until all personnel or crew has cleared the area.

Do not refuel the fuel tank while the engine is operating, do not smoke, avoid an open flame, avoid spilling and splashing fuel, and provide a metal to metal contact between the filling device and fuel tank.

Keep a fire extinguisher serviced and ready for use.

Avoid inhaling toxic fumes caused by the use of a fire extinguisher.

Keep all controls and instruments clean.

### **AFTER OPERATION**

See that the fire extinguisher is serviced and ready for use.

Remove all dirt, oil, mud, and excess cement from controls, levers, accessories, and components.

Changes in Force: C 1 and C 4

**\*TM 5-3895-221-15  
C4  
TO 36C14-3-12-11**

Change

No. 4

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
AND THE AIR FORCE  
Washington, D. C., 28 June 1973

**Operator, Organizational, Direct Support,  
General Support, and Depot Maintenance Manual  
MIXER, CONCRETE, TRAILER MOUNTED:  
GASOLINE DRIVEN; 16 CU FT  
(CHAIN BELT MODEL HBG)  
FSN 3895-835-4512**

TM 5-3895-221-15, 30 August 1962, is changed as follows:

*Cover.* The title is changed to read as shown above.

*Page 1.* The title is changed to read as shown above.

*Page 3.* In the table of contents, Appendix III is superseded as follows:

**APPENDIX III.  
BASIC ISSUE ITEMS LIST AND ITEMS  
TROOP INSTALLED OR AUTHORIZED**

*Page 5.* Subparagraph 1c is superseded as follows:

*c.* You can improve this manual by calling attention to errors and by recommending improvements, using DA Form 2028 (Recommended Changes to Publications), or by letter, and mail-

ing directly to Commander, U.S. Army Troop Support Command, ATTN: AMSTS-MP, 4300 Goodfellow Blvd., St. Louis, Mo. 63120.

*Page 15.* In subparagraph 5i, the towing speeds are superseded as follows:

Towing speeds:

Highway ..... 15 MPH  
Off-highway ..... 5 MPH

*Page 17.* Subparagraph 10f is added after subparagraph 10e.

*f.* The towing pole and towing pole sleeve (tongue) (4 and 8, fig. 54) must be removed to allow the loading skip to function properly. To remove the towing tongue, remove cotter pin (5) and pivot pin (7).

*Page 119.* Appendix III is superseded as follows:

**APPENDIX III  
BASIC ISSUE ITEM LIST AND ITEMS  
TROOP INSTALLED OR AUTHORIZED**

**Section I. INTRODUCTION**

**1. Scope**

This appendix lists basic issue items, items troop

installed or authorized which accompany the concrete mixer and are required by the crew/

**\*This change supersedes 3, 15 April 1968.**

operator for operation, installation, or operator's maintenance.

## 2. General

This basic issue items, items troop installed or authorized list is divided into the following sections:

a. *Basic Issue Items List—Section II.* Not applicable.

b. *Items Troop Installed or Authorized List—Section III.* A list in alphabetical sequence of items which at the discretion of the unit commander may accompany the end item, but are NOT subject to be turned in with the end item.

## 3. Explanation of Columns

The following provides an explanation of columns in the tabular list of Basic Issue Items List—Section II, and Items Troop Installed or

Authorized, Section III.

a. *Source, Maintenance, and Recoverability Code(s) (SMR):* Not applicable.

b. *Federal Stock Number.* This column indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. *Description.* This column indicates the Federal item name and any additional description of the item required.

d. *Unit of Measure (U/M).* A 2-character alphabetic abbreviation indicating the amount or quantity of the item upon which the allowances are based e.g., ft, ea, pr, etc.

e. *Quantity Authorized (Items Troop Installed or Authorized Only).* This column indicates the quantity of the item authorized to be used with the equipment.

### Section III. ITEMS TROOP INSTALLED OR AUTHORIZED LIST

(1) SMR code	(2) Federal stock No.	(3) Ref. No. & Mfr code Description Usable on code	(4) Unit of meas.	(5) Qty auth
	4210-580-6970	EXTINGUISHER, FIRE	EA	1

By Order of the Secretaries of the Army, and the Air Force:

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Distribution:

To be distributed in accordance with DA Form 12-25B (qty rqr block No. 429, Operator's Maintenance requirements for Mixer, Concrete.



TECHNICAL MANUAL

Operator, Organizational, Field, and Depot Maintenance Manual

MIXER, CONCRETE, TRAILER MOUNTED: GASOLINE DRIVEN;  
16 CU. FT. (CHAIN BELT MODEL HBG) FSN 3895-835-4512

TM 5-3895-221-15 }  
CHANGES No. 1 }

HEADQUARTERS,  
DEPARTMENT OF THE ARMY  
WASHINGTON 25, D.C., 7 May 1963

TM 5-3895-221-15, 30 August 1962, is changed as follows:

Page 1. Chapter 3. Section II. Delete and substitute Preventive maintenance services.

Page 5, paragraph 1c. Line 5. Delete Engineer Maintenance Center: EMCD-S, and substitute Mobility Support Center, ATTN: SMOMS-MS.

Paragraph 1.

d. (Superseded) Report all equipment improvement recommendations as prescribed by TM 38-750.

Paragraph 2. Lines 1 and 2. Delete and substitute the following:

Page 32.

DA Form 2258 Depreservation Guide of  
Engineer Equipment

For other record and report forms applicable to the operation and maintenance of this equipment, refer to TM 38-750.

Page 16, paragraph 9a. Line 1. Delete before-operation and substitute the daily preventive maintenance.

Page 20, paragraph 16a.(1) Line 1. Delete before-operation and substitute daily preventive maintenance.

Paragraph 17a.(5) Delete entirely.

Section II. PREVENTIVE MAINTENANCE SERVICES  
(Title superseded)

28. General  
(Superseded)

To insure that the concrete mixer is ready for operation at all times, it must be inspected systematically, so that defects may be discovered and corrected before they result in serious damage or failure. The necessary Preventive Maintenance Services to be performed are listed and described in paragraphs 29 and 30-32. The item numbers indicate the sequence of minimum inspection requirements. Defects discovered during operation of the unit shall be noted for future correction, to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noted during op-

eration which would damage the equipment if operation were continued. All deficiencies and shortcomings will be recorded, together with the corrective action taken, on DA Form 2404 at the earliest possible opportunity.

29. Daily Preventive Maintenance Services  
(Superseded)

This paragraph contains an illustrated tabulated listing of preventive maintenance services which must be performed by the operator. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to figure 9.1 for the Daily Preventive Maintenance Services.

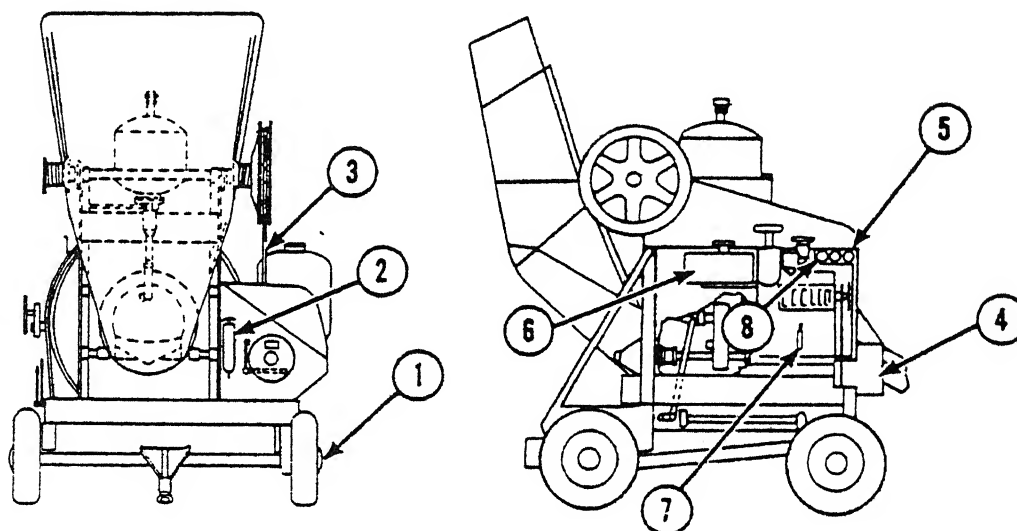
# PREVENTIVE MAINTENANCE SERVICES

## DAILY

TM 5-3895-221-15

CHAIN BELT MODEL HBG

CONCRETE MIXER



LUBRICATE IN ACCORDANCE WITH CURRENT LUBRICATION ORDER

ITEM		PAR. REF
1	<u>TIRES</u> . Perform visual check for proper inflation. Correct air pressure is 40 psi.	
2	<u>FIRE EXTINGUISHER</u> . Check seal.	
3	<u>CABLE (WIRE ROPE)</u> . Check for kinks, breaks, and fraying. (Biweekly)	
4	<u>BATTERIES</u> . Check electrolyte level and hand tightness of connections. Fill to 1/2 inch above the plates. In freezing weather run the engine one hour after adding water. (Weekly)	
5	<u>COOLING SYSTEM</u> . Check level. Fill to 2 inches below filler neck.	

Figure 9.1. (Added) Daily preventive maintenance services.

ITEM		PAR. REF
6	<u>FUEL SYSTEM.</u> Drain and clean sediment bowl (biweekly). Check fuel level.	
7	<u>ENGINE OIL LEVEL.</u> Check oil level. Add oil to proper level.	
8	<u>GAGES AND INSTRUMENTS.</u> Normal readings are: Oil pressure - 10 to 15 psi, Water temperature - 160° to 180°F, Battery indicator - in CHARGE range, Tach-hourmeter - 900 to 1800 rpm.	
	<u>NOTE, OPERATION.</u> During operation check all controls for proper operation.	

MSC 3895-221-15/9.1

Figure 9.1—Continued.

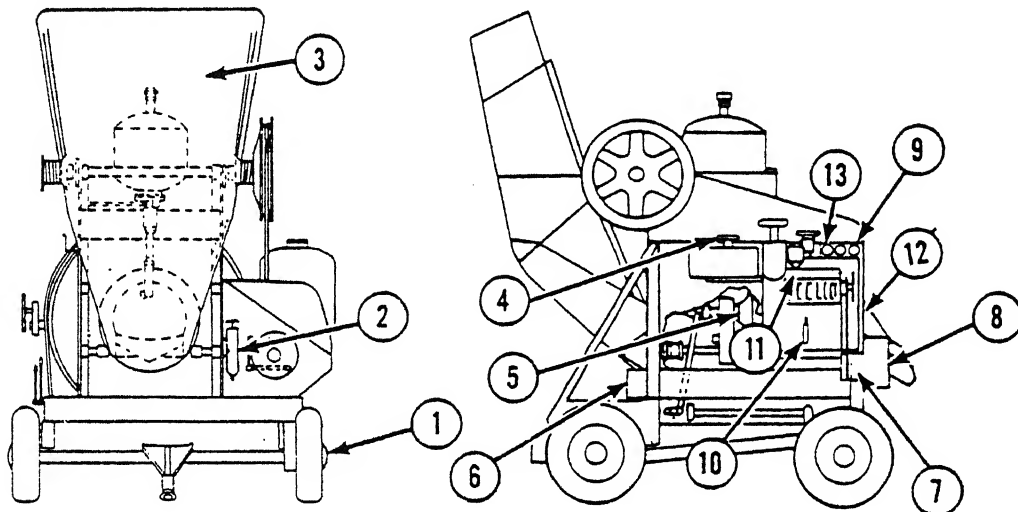
# PREVENTIVE MAINTENANCE SERVICES

## QUARTERLY

TM 5-3895-221-15

CONCRETE MIXER

CHAIN BELT MODEL HBG



LUBRICATE IN ACCORDANCE WITH CURRENT LUBRICATION ORDER

ITEM		PAR. REF
1	<u>TIRES.</u> Inspect for breaks, cuts, and excessive wear. Check air pressure. Correct pressure is 40 psi.	
2	<u>FIRE EXTINGUISHER.</u> Check for broken seal. Inspect for full charge by shaking for sound and weight.	
3	<u>SKIP, DRUM AND DISCHARGE CHUTE.</u> Inspect for loose and missing hardware and excessive wear. Check cable (wire breaks and fraying. Check for proper operation.	
	Check external carburetor and governor adjust- governor for 1800 rpm. Correct fuel leaks. Clean strainer. Check fuel level.	

terly preventive maintenance services.

AGO 9090A

ITEM		PAR. REF
5	<u>CLUTCHES AND BRAKES.</u> Inspect for loose and missing hardware and excessive wear. Check for proper operation and adjustment (1000 hours).	
6	<u>LEVERS AND LINKAGE.</u> Inspect for loose and missing hardware and excessive wear. Check for proper operation and adjustment (1000 hours).	
7	<u>MIXER WATER SYSTEM.</u> Inspect for loose and missing hardware and proper operation. Correct leaks. (1000 hours)	
8	<u>ELECTRICAL SYSTEM.</u> Check ignition point clearance (0.018 to 0.020 inch) and spark plug clearance (0.025 inch) (500 hours). Check generator and regulator for proper operation. Check generator brushes (1000 hours). Check starter for proper operation. Check battery electrolyte level and specific gravity. Fill to 1/2 inch above plates. In freezing weather run the engine one hour after adding water. Tighten all loose connections; replace defective wiring.	
9	<u>COOLING SYSTEM.</u> Check coolant level; fill to 2 inches below filler neck. Check for correct antifreeze solution. Clean radiator air passages. Correct coolant leaks.	
10	<u>LUBRICATING SYSTEM.</u> Check engine oil level. Add oil to correct level. Correct lubricant leaks. Lubricate in accordance with current LO.	
11	<u>VALVE ADJUSTMENT AND COMPRESSION TEST.</u> Check valve clearance. Intake - 0.006 inch, Exhaust - 0.008 inch (hot). Check compression, 10 psi maximum variation between cylinders. (1000 hours)	
12	<u>BELTS.</u> Check for breaks, wear, fraying, and proper adjustment. Proper tension is 3/4 to 1 inch deflection midway between pulleys.	
13	<u>INSTRUMENTS.</u> Inspect for loose and missing hardware and proper operation. Normal operating readings are: Oil pressure - 10 to 15 psi, Water temperature - 160° to 180°F, Battery condition indicator - in CHARGE range, Tach-hourmeter - 900 to 1800 rpm.	
	<u>NOTE. OPERATIONAL TEST.</u> During operation check for unusual noise or vibration and proper operation.	

MSC 3895-221-15/9.2

Figure 9.2—Continued

### 30. Quarterly Preventive Maintenance Services

(Superseded)

a. This paragraph contains an illustrated tabulated listing of preventive maintenance services which must be performed by Organizational Maintenance personnel at quarterly intervals. A quarterly interval is equal to 3 calendar months or 250 hours of operation, whichever occurs first.

b. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to figure 9.2 for the Quarterly Preventive Maintenance Services.

31. Organizational Maintenance. Rescinded.

32. Quarterly service. Rescinded.

Page 46, paragraph 63b.(4), lines 1 and 2. Delete Record the reading on DA Form 464.

Paragraph 63b.(6), line 2. Delete and record the reading on DA Form 464.

Page 108, paragraph 160b. Lines 3 thru 5. Delete second sentence and substitute as follows:

All deficiencies will be recorded, together with the corrective action taken, on DA Form 2404.

Paragraph 163.

b. (Superseded) *Worksheet and Preventive Maintenance*. DA Form 2258 (Depreservation Guide of Engineer Equipment) and applicable forms listed in TM 38-750 shall be prepared for each major item of equipment when initially placed in limited storage and every 90 days thereafter. Perform required maintenance promptly to make sure equipment is mechanically sound and ready for immediate use.

c. (Superseded) *Exercising*. Service equipment in limited storage every 90 days in accordance with paragraph 30-32. Operate equipment long enough to bring it up to operating temperature and insure complete lubrication of all bearings, gears, and the like. Represerve equipment after operation.

Page 109, APPENDIX I. Paragraph 5. Line 1. Delete entirely. Add the following:

TM 38-750 The Army Equipment Records System and Procedures

Paragraph 11. Delete in its entirety.

Page 119. APPENDIX III. Paragraph 4. Lines 3 and 4. Delete Engineer Maintenance Center, ATTN: EMCDM-S and substitute Mobility Support Center, ATTN: SMOMS-MS.

By order of the Secretary of the Army:

EARLE G. WHEELER,  
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5-279  
5-500 (EA, EB, HF, HG)  
19-256  
55-500, EL

NG: State AG (3).

USAR: Units—same as Active Army except allowance is one copy to each unit.  
For explanation of abbreviations used see AR 320-50.





TECHNICAL MANUAL }  
No. 3895-221-15 }

HEADQUARTERS,  
DEPARTMENT OF THE ARMY  
WASHINGTON 25, D. C., 30 August 1962

OPERATOR, ORGANIZATIONAL, FIELD, AND DEPOT MAINTENANCE MANUAL  
MIXER, CONCRETE, TRAILER MOUNTED: GASOLINE DRIVEN; 16 CU. FT.  
(CHAIN BELT MODEL HBG) FSN 3895-835-4512

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## CHAPTER 1 INTRODUCTION

### Section I. GENERAL

#### 1. SCOPE

a. These instructions are published for the use of the personnel to whom the Chain Belt Model HBG Concrete Mixer is issued. Chapters 1 through 3 provide information on the operation, daily preventive maintenance services, and organizational maintenance of accessories, components, and attachments. Chapter 4 provides information for field and depot maintenance. Chapter 5 provides information for demolition, shipment, and limited storage. This manual also provides descriptions of the main units and their functions in relationship to other components.

b. Appendix I contains a list of publications applicable to this manual. Appendix II contains the Maintenance Allocation Chart. Appendix III contains the list of Basic Issue Items authorized the operator of this equipment. The organizational, Field, and Depot Maintenance Repair Parts and Special Tool Lists are listed in TM 5-3895-221-20P and TM 5-3895-221-35P.

c. Report all deficiencies in this manual on DA Form 2028 (Recommended Changes to DA Technical Manual Parts List or Supply Manual 7, 8 or 9). Submit recommendations for changes additions, or deletions to the Commanding Officer, U. S. Army Engineer Maintenance Center: EMCD-S, P. O. Box 119, Columbus 16, Ohio. Direct communication is authorized.

d. Report unsatisfactory equipment performance and suggestions for equipment improvement as specified in AR 700-38.

#### 2. RECORD AND REPORT FORMS

For record and report forms applicable to the operator, crew, and organizational maintenance, refer to TM 5-505.

#### NOTE

Applicable forms, excluding standard Form 46 which is carried by the operator, will be kept in a canvas bag mounted on the equipment.

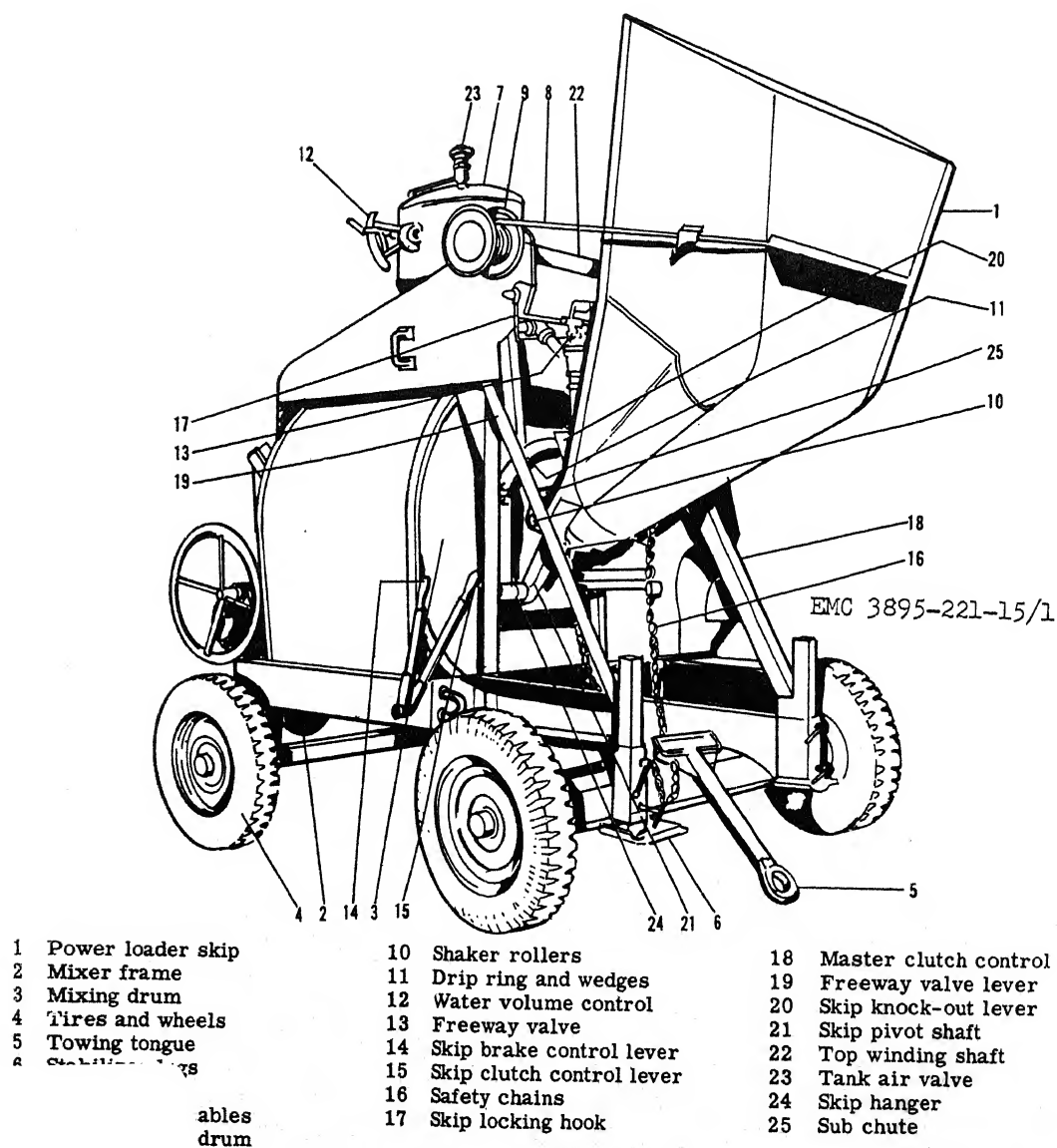


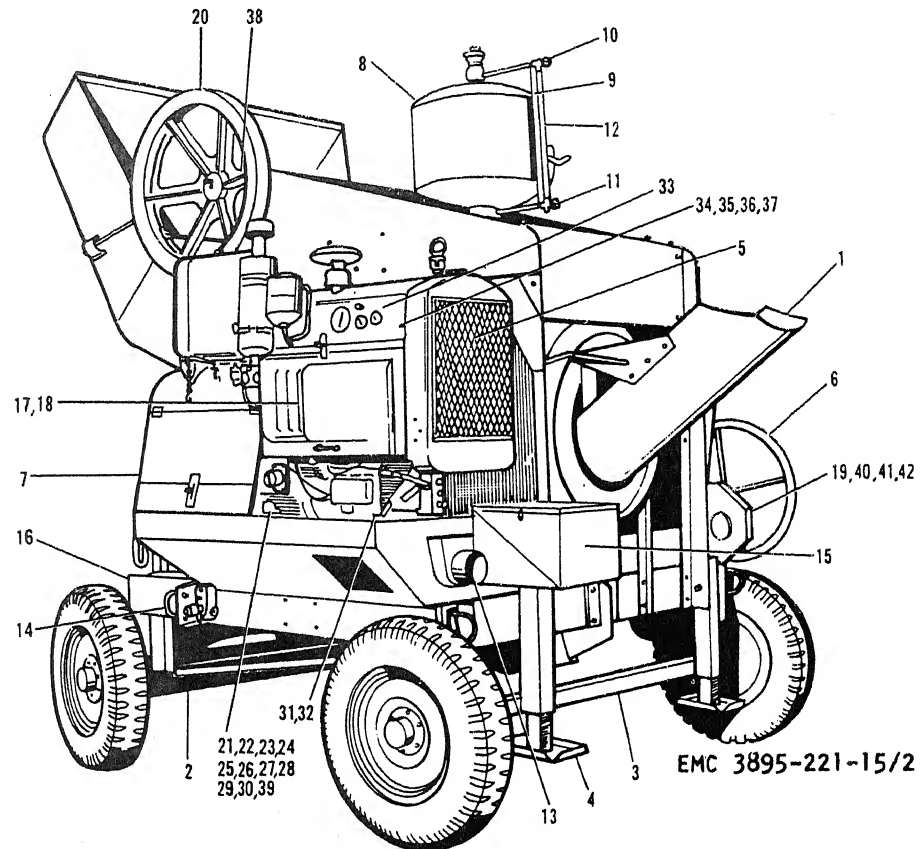
Figure 1. MIXER, CONCRETE, RIGHT FRONT VIEW

### 3. DESCRIPTION

a. General. The Chain Belt Company Model HB-G concrete mixer (figs. 1 and 2) is a self contained, non-tilting, portable unit designed to mix measured amounts of sand, gravel or crushed stone, cement, and water to produce concrete. The function of the concrete mixer is accomplished by loading the skip (1, Fig. 1) with specific amounts of the above mentioned dry materials, called aggregate. Raising the skip to its vertical position, empties the aggregate into the interior of the mixing drum (3, Fig. 1)

which is equipped with bucket-blade extensions. As water is metered into the revolving drum, the buckets pick up the aggregate and cascade it into the blade extensions which turn it over and return it again to the buckets for repeated mixing. This mixing cycle continues until proper consistency is achieved; lowering the discharge chute (1, Fig. 2) as the drum revolves, allows the finished concrete to drop onto the chute and is thereby discharged.

b. Mixer. The mixer consists of a heavy gauge metal frame (2, Fig. 1) which is supported on front and rear axles



- |                                |                             |                               |
|--------------------------------|-----------------------------|-------------------------------|
| 1 Discharge chute              | 15 Battery box              | 29 Lock washer                |
| 2 Front axle                   | 16 Tool box                 | 30 Rear support angle         |
| 3 Rear axle                    | 17 Engine side panel, R. H. | 31 Front support angle, R. H. |
| 4 Stabilizer legs              | 18 Engine side panel, L. H. | 32 Front support angle, L. H. |
| 5 Four cylinder engine         | 19 Gear case                | 33 Engine hood                |
| 6 Discharge chute handwheel    | 20 Reduction drum           | 34 Hood screw                 |
| 7 Countershaft housing         | 21 Shakeproof lock washer   | 35 Lock washer                |
| 8 Water tank                   | 22 Spacer block             | 36 Screw                      |
| 9 Liquid level sight gage      | 23 Cap screw                | 37 Hood nut                   |
| 10 Gage angle valve            | 24 Hex nut                  | 38 Winding drum               |
| 11 Gage angle valve with drain | 25 Lock washer              | 39 Shim                       |
| 12 Gage guard rod              | 26 Plain washer             | 40 Cap screw                  |
| 13 Auxiliary water pump        | 27 Cap screw                | 41 Hex nut                    |
| 14 Tiedown eye                 | 28 Hex nut                  | 42 Lock washer                |

Figure 2. MIXER, CONCRETE, LEFT REAR VIEW

(2 and 3, Fig. 2) having pneumatic-tired wheels (4, Fig. 1) and is trailerized from a towing vehicle by means of a towing tongue (5, Fig. 1). Stabilizer legs (6 and 4, Figs. 1 and 2) are provided to relieve aggregate weight from the tires. All of the controls and equipment necessary to operate the mixer are mounted on, and are a part of the concrete mixer. These major assemblies are: a four-cylinder Hercules engine (5, Fig. 2) power loader skip (1, Fig. 1), mixing drum (3, Fig. 1), water tank (7, Fig. 1), discharge chute (1, Fig. 2), chute (1, Fig. 2), chute handwheel (6, Fig. 2) and the skip brake and clutch levers (14 and 15, Fig. 1). The mixer receives its power, or is actuated by the engine through a chain sprocket, and shaft drive system. The skip clutch and brake levers control the raising and lowering of the skip by means of cables (8, Fig. 1) and winding drums (9). Skip shaker rollers (10, Fig. 1) assures complete skip discharge; as the raised portions (wedges) of the revolving drip ring (11, Fig. 1) strike the skip

rollers in their vertical position, the skip is shaken or agitated into depositing all of its contents into the drum. Water is supplied and metered into the revolving drum from the water tank (7, Fig. 1) and volume control (12, Fig. 1) through the water system freeway valve (13, Fig. 1).

c. Engine. The power source for the concrete mixer is a Hercules Model IXB3ER, four-cylinder, four-cylinder, four-cycle, L-head, liquid-cooled, electric-start, gasoline engine (Fig. 3). A magneto (69) driven by the governor (41) drive gear through an impulse coupling in the magneto and provides the spark for the ignition system. An updraft carburetor (77), mixes fuel with air in the proper ratio for all engine speeds and load conditions. A governor (41), of the centrifugal flyweight type controls the engine speed to suit the load imposed upon the engine. Power is transferred to the mixer drive assembly through a stub shaft attached to the engine output shaft.

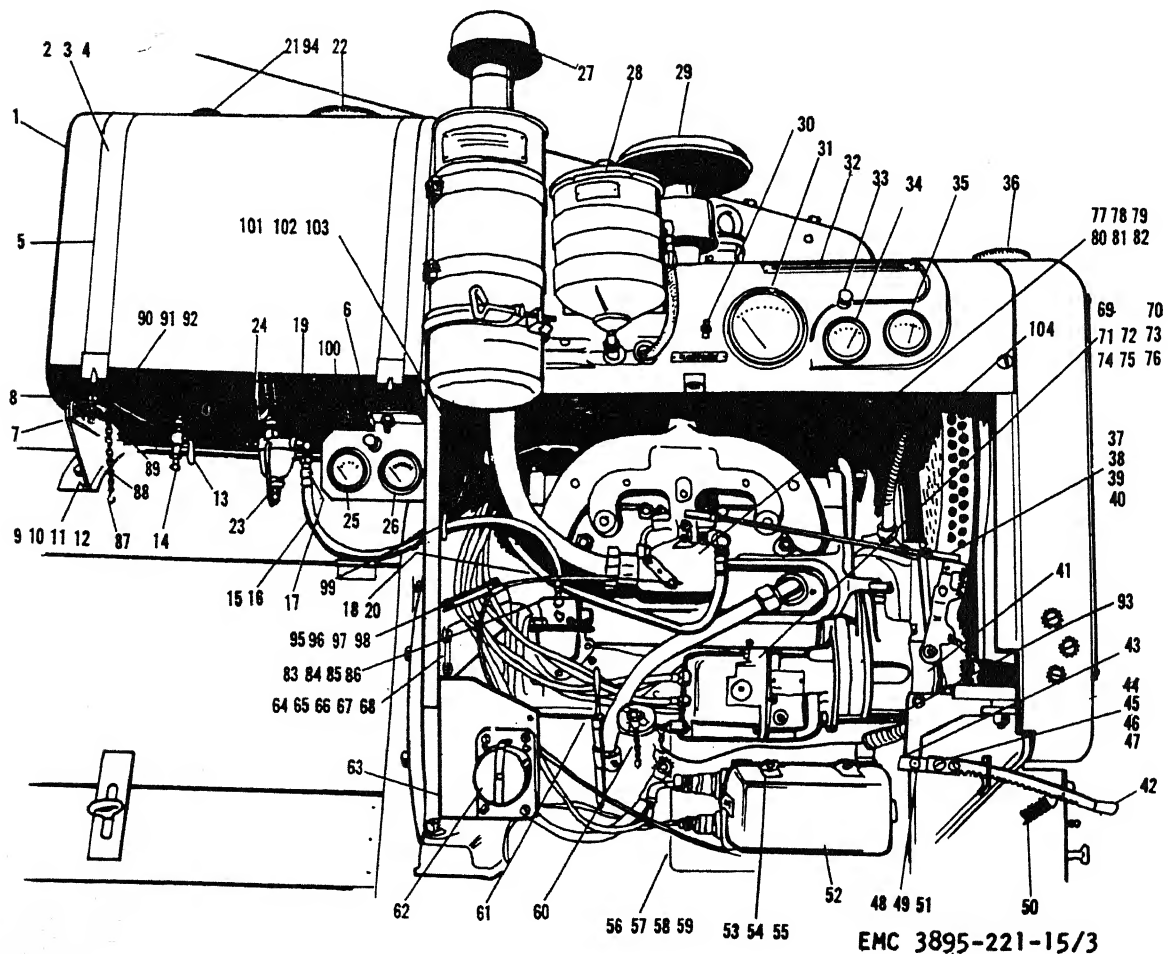
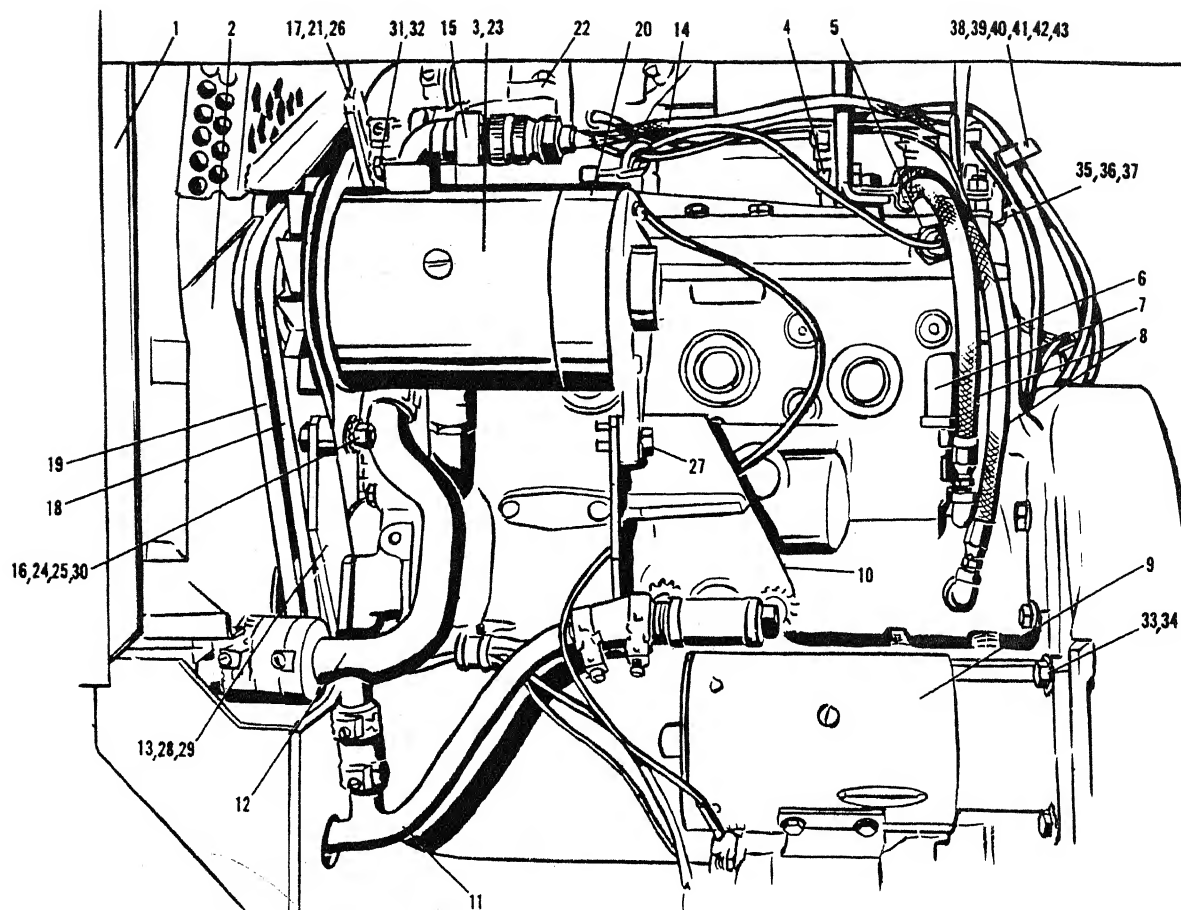


Figure 3. ENGINE COMPONENTS, MANIFOLD SIDE



# LEGEND FOR FIGURE 3

1	Fuel tank	53	Screw
2	Hold down strap	54	Lock washer
3	Strap nut	55	Lock nut
4	Strap washer	56	Mounting bracket
5	Anti-squeak	57	Screw
6	Tank support, R. H.	58	Nut
7	Tank support, L. H.	59	Washer
8	Tank bracket	60	Oil filler tube
9	Screw	61	Oil level dip-stick
10	Nut	62	Battery receptacle
11	Lock washer	63	Mounting bracket
12	Plain washer	64	Lock washer
13	Drain cock	65	Spacer
14	Drain plug	66	Screw
15	Fuel line assembly	67	Nut
16	Fuel line	68	Lock washer
17	Line fitting	69	Magneto
18	Line fitting	70	Gasket
19	Strainer elbow	71	Stud
20	Fuel pump elbow	72	Screw
21	Fuel level sending unit	73	Lock washer
22	Fuel filler cap	74	Plain washer
23	Fuel strainer assembly	75	Stud nut
24	Fuel shut-off valve	76	Nut
25	Fuel level gage	77	Carburetor assembly
26	Battery indicator gage	78	Gasket
27	Air cleaner assembly	79	Stud
28	Oil filter assembly	80	Stud nut
29	Exhaust muffler and pipe	81	Lock washer
30	Panel light switch	82	Plain washer
31	Tach-hourmeter	83	Fuel pump
32	Engine instruction plate	84	Gasket
33	Panel light	85	Screw
34	Oil pressure gage	86	Lock washer
35	Water temperature gage	87	"S" hook
36	Radiator coolant fill cap	88	Sash chain
37	Governor control rod	89	Coldshut
38	Ball joint	90	Hex nut
39	Ball joint nut	91	Lock washer
40	Ball joint lock washer	92	Flat washer
41	Governor assembly	93	Speed adjusting screw
42	Control latch	94	Sending unit gasket
43	Latch link	95	Cable clamp
44	Plain washer	96	Clamp screw
45	Latch screw	97	Clamp nut
46	Latch nut	98	Clamp lock washer
47	Lock washer	99	Fuel line grommet
48	Clevis pin	100	Instrument panel
49	Washer	101	Panel spacer
50	Hold down spring	102	Panel screw
51	Cotter pin	103	Lock washer
52	Voltage regulator assembly	104	Tachometer cable



EMC 3895-221-15/4

1 Radiator	15 Cable terminal	30 Hinge bolt nut
2 Fan	16 Mounting nuts	31 Hinge bolt
3 Generator	17 Adjusting bracket	32 Plain washer
4 Spark plug	18 Fan belts	33 Screw
5 Water temperature sending unit	19 Pulley	34 Lock washer
6 Oil pressure sending unit	20 Cover band	35 Cable bracket
7 Crankcase breather	21 Cap screw	36 Spacer washer
8 Inlet and outlet oil lines	22 Thermostat housing	37 Cable bracket
9 Starter motor	23 Generator mounting gasket	38 Cable clamp
10 Generator bracket, rear	24 Hinge bolt	39 Cable clamp
11 Water drain line	25 Lock washer	40 Screw
12 Water circulating line	26 Lock washer	41 Lock washer
13 Generator bracket, front	27 Hinge bolt	42 Clamp nut
14 Shielded cable	28 Front bracket screw	43 Spacer washer
	29 Lock washer	

Figure 4. ENGINE COMPONENTS, MIXER DRUM SIDE VIEW

#### 4. IDENTIFICATION

The concrete mixer is supplied with five identification

and data plates, as shown in Figure 5. They are all located on the forward end of the counter shaft housing (7, Fig. 2).

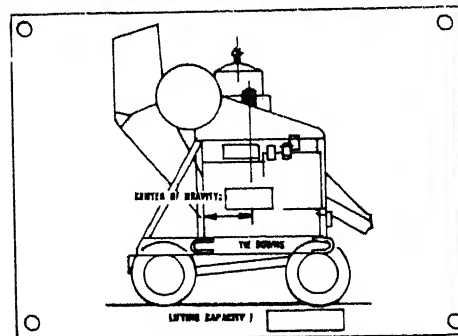
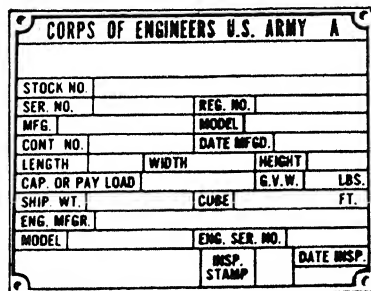
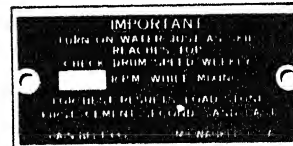


Figure 5. IDENTIFICATION AND DATA PLATES

#### 5. TABULATED DATA

##### a. End Item.

Manufacturer . . . . . Chain Belt Company  
Model . . . . . HB-G  
Type . . . . . Trailer Mounted

##### b. Engine.

Manufacturer . . . . . Hercules Motor Corp.  
Model . . . . . IXB3ER  
Type . . . . . Gasoline, L head  
Number of cylinders . . . . . 4  
RPM . . . . . 900-1800 rpm  
Firing order . . . . . 1-2-4-3  
Rated horsepower . . . . . 32.5 @ 1800 rpm  
Bore . . . . . 3-1/4 inches  
Stroke . . . . . 4 inches  
Compression ratio . . . . . 16.9  
Piston displacement . . . . . 133 cu. in.  
Cycles . . . . . 4  
Cooling . . . . . Liquid

##### c. Accessory Items.

ITEM	MANUFACTURER	MODEL OR TYPE
Oil filter	Fram	7407
Air Cleaner	Donaldson	FGA05-2515
Fuel Filter	Tillotson	OW-469
Carburetor	Marvel-Schebler	TSX-455
Magneto	Fairbanks-Morse	FMXE-4B14E-1
Governor	Pierce	GC-10004

##### c. (Continued)

Generator	Electric Autolite	GHS-6002DT
Starter	Electric Autolite	MFD-6002T
Regulator	Electric Autolite	VBU-4002UT
Fuel Pump	A. C.	1539879
Spark Plugs	Champion	XEJ-88
Batteries	Willard	Type 2HN, 12 volt

##### d. Capacities.

Engine . . . . .	5-1/2 quarts
Fuel tank . . . . .	20 gallons
Cooling system . . . . .	12 quarts
Air cleaner . . . . .	1/4 quart

##### e. Adjustment Data.

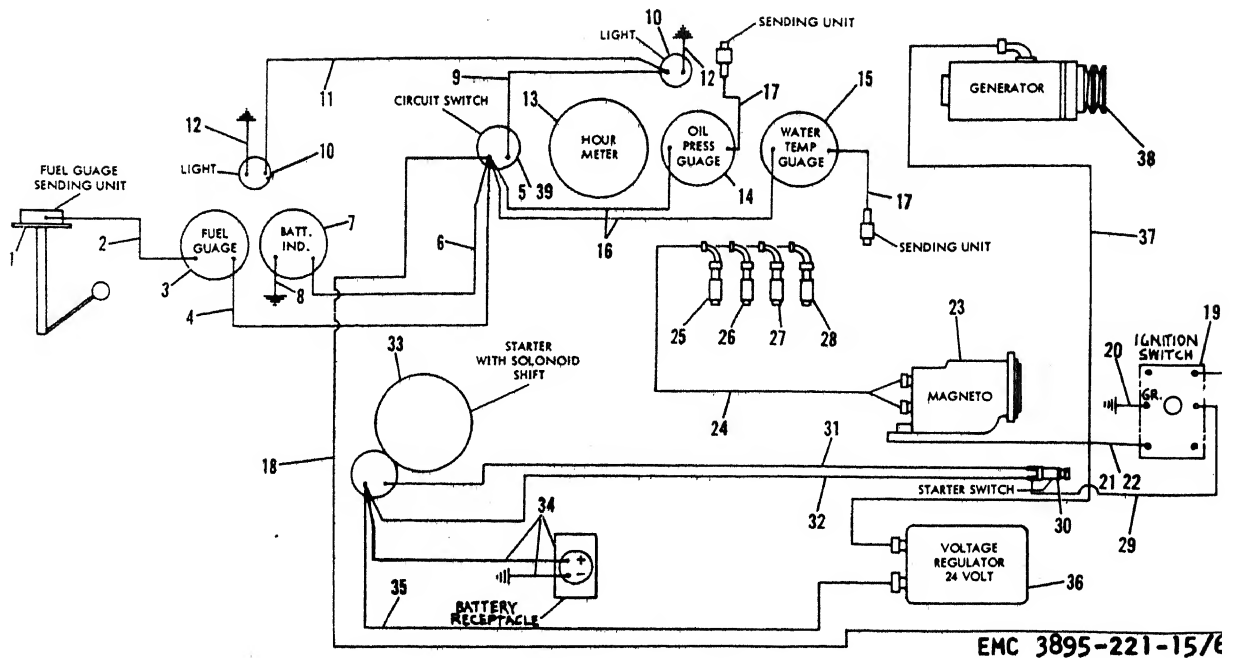
Valve tappet clearance,	
intake, hot . . . . .	0.006 inch
Valve tappet clearance,	
exhaust, hot . . . . .	0.008 inch
Spark plug gap . . . . .	0.018 to 0.020 inch

##### f. Nut and Bolt Torque Data.

Item	Foot
Main bearings - All . . . . .	
Connecting rod . . . . .	
Cylinder Head screw . . . . .	
Flywheel bolt . . . . .	

g. Wiring Diagram. Figure 6 illustrates a practical

wiring diagram of the concrete mixer electrical system.



- |  |   |
|--|---|
| 1 Fuel gage sending unit                                     | 20 Ignition switch ground wire assembly     |
| 2 Sending unit to fuel gage wire assembly                    | 21 Ignition switch to magneto wire assembly |
| 3 Fuel gage  | 22 Wire loom                                |
| 4 Fuel gage to switch wire assembly                          | 23 Magneto                                  |
| 5 Light switch   | 24 Magneto cable assembly                   |
| 6 Switch to battery indicator wire assembly                  | 25 Magneto cable No. 1                      |
| 7 Battery indicator  | 26 Magneto cable No. 2                      |
| 8 Indicator ground wire assembly                             | 27 Magneto cable No. 3                      |
| 9 Switch to panel light wire assembly                        | 28 Magneto cable No. 4                      |
| 10 Panel light   | 29 Ignition to starter switch wire assembly |
| 11 Panel light to light wire assembly                        | 30 Starter switch                           |
| 12 Panel light ground wire assembly                          | 31 Switch to starter solenoid wire assembly |
| 13 Tachometer and hourmeter                                  | 32 Switch to starter solenoid wire assembly |
| 14 Oil pressure gage   | 33 Starter motor                            |
| 15 Water temperature gage                                    | 34 Battery receptacle                       |
| 16 Switch to pressure and temperature gages wire assemblies. | 35 Solenoid to regulator wire assembly      |
| 17 Pressure and temperature gage sending units               | 36 Voltage regulator                        |
| 18 Light switch to ignition switch wire assembly             | 37 Regulator to generator wire assembly     |
| 19 Ignition switch   | 38 Generator                                |
|  | 39 Switch screw                             |

Figure 6. CONCRETE MIXER WIRING DIAGRAM

h. Shipping Dimensions.

Overall length ..... 8 feet, 9 inches  
 Overall width ..... 7 feet, 10 inches  
 Overall height ..... 10 feet, 8 inches

Shipping weight ..... 6240 pounds

i. Maintenance and operating Supplies. Table I contains a listing of all oils, grease, fuel, and anti-freeze required for the initial operation of the equipment.

TABLE I. MAINTENANCE AND OPERATING SUPPLIES

Item	Component application	Source of supply	Federal stock No.	Description	Quantity required for initial operation	Quantity required for 8 hours operation	Notes
1	0101-CRANKCASE, ENGINE (1)	10	9150-265-9435	OIL, LUBRICATING: 5-gal pails as follows: OE-30 or	5-1/2 qt	(2)	(1) Includes quantity of oil to fill engine oil system as follows: 4-1/2 qt-Crankcase 1 qt-Oil filter
		10	9150-231-6653	Grade 9250	5-1/2 qt	(2)	
		10	9150-265-9428	OE-10 or	5-1/2 qt	(2)	
		10	9150-231-9037	Grade 9110	5-1/2 qt	(2)	(2) See LO 5-3895-221-15 for grade application and replenishment intervals.
		10	9150-242-7603	OES			
2	0304-AIR CLEANER (3)			OIL, LUBRICATING: (3)	3/4 qt	(2)	
3	0306-TANK, FUEL			GASOLINE, AUTOMOTIVE: Combat, bulk as follows: 91A	20 gal (4)	16 gal (5)	(3) Use oil as prescribed in item (1) above. (4) Tank capacity.
4	0501-RADIATOR		10	9130-160-1818	12 qt (6)		(5) Average consumption is 2 gph of continuous operation.
				WATER: ANTIFREEZE: 55-gal drum as follows: ANTIFREEZE: Ethylene glycol ANTIFREEZE: Compound artic	(7)		(6) Cooling system capacity. (7) See Table II, for quantities, ambient temperatures and specific gravities.
5	0800-POWER TRANSFER Assembly (3)			OIL, LUBRICATING (3)	3/4 qt	(2)	
6	DRUM DRIVE CHAIN AND CABLES			OIL, LUBRICATING, CHAIN, WIRE ROPE, EXPOSED GEAR: 35-lb pail as follows: CW-11c	as required	(2)	
		10	9150-264-2918				

TABLE 1. MAINTENANCE AND SUPPLIES—Continued

Item	Component application	Source of supply	Federal stock No.	Description	Quantity required for initial operation	Quantity required for 8 hours operation	Notes
7	OIL CAN POINTS (3)			OIL, LUBRICATING: (3)	as rqr	(2)	
8	GREASE POINTS			GREASE, AUTOMOTIVE ARTILLERY: 5-lb can as follows: GAA			
		10	9150-190-0905		as rqr	(2)	

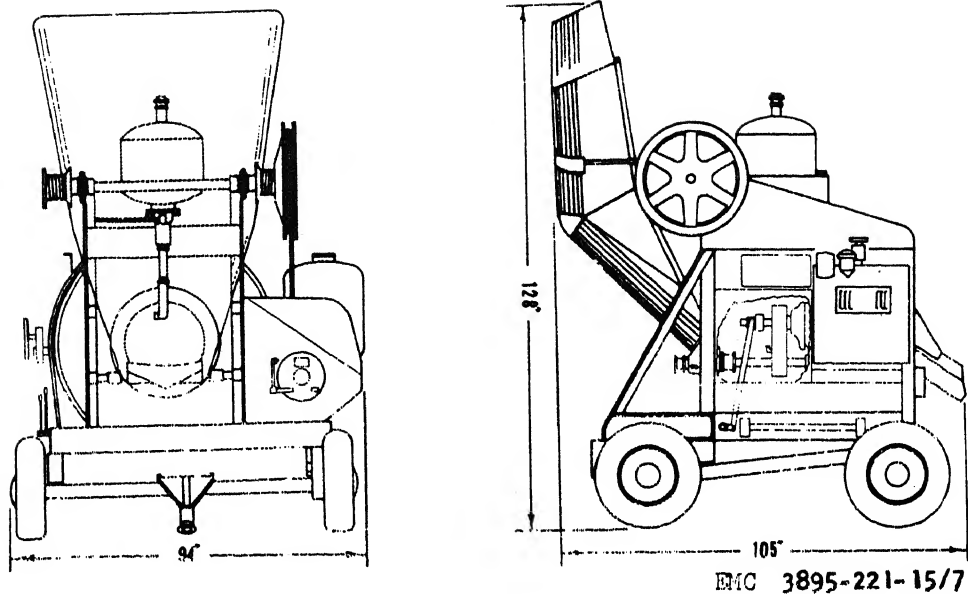


Figure 7. Concrete Mixer Shipping Dimensions.

#### j. Performance Data

Amount per batch . . . . . 16 Cu. Ft.  
Time per batch . . . . . 60 Seconds

#### Towing speeds:

Highway . . . . . 40 Mph.  
Off-highway . . . . . 15 Mph.

#### 6. DIFFERENCES IN MODELS

This manual covers only the Chain Belt Company Model HBG. No known unit differences exist for the model covered by this manual.

## CHAPTER 2

### OPERATING INSTRUCTIONS

#### Section 1. SERVICE UPON RECEIPT OF EQUIPMENT

##### 7. UNLOADING EQUIPMENT

a. General. Concrete mixers are usually shipped completely assembled, except for the water tank level sight gage (9, Fig. 2). This is packed separately and is to be installed before operation. Mixers are shipped on railroad flatcars for domestic shipment, and are secured thereon with wheel blocks and metal banding material (straps).

##### b. Removal of cables and Blocking.

- (1) Disconnect and remove all tie-down straps from the front and rear tie-down eyes.
- (2) Using a pinch bar, remove all blocks and bracing which support the mixer wheels. Be sure to pull out all nails.
- (3) Remove the straps which secure the front and rear axles, and also the towing tongue to the flatcar.

#### CAUTION

Upon removal of all blocking and hold-down devices, but before moving the mixer, be sure that all nails or other abrasive items which might puncture or cut the tires are removed from the flatcar bed and ramp.

##### c. Unloading.

- (1) When using a towing vehicle, back the vehicle up the flatcar ramp until connection with the mixer towing tongue and safety chains can be accomplished. Upon connection, slowly tow the mixer down the ramp and away from the flatcar so that the process may be repeated with other mixers.

#### WARNING

Be sure that the ramp itself is adequately supported to withstand the combined weights of both vehicles. Never allow the mixer to roll freely down the ramp or other inclined surface.

- (2) When using an overhead crane, lift the mixer from the flatcar being sure that the weight is evenly distributed (see lifting diagram on mixer.) Check the crane's lifting capacity and the mixer weight (6240 pounds) before lifting.

- (3) Attach lifting cable to lifting eye located on top of the mixer directly above the center of balance as shown on the lifting diagram on the mixer. Attach guide lines to two or more of the tie-down eyes located on each corner of the mixer. This is to assure the mixer does not swing during the unloading operation.

##### 8. UNPACKING AND INSPECTION OF EQUIPMENT

a. Unpacking equipment. Prepare the mixer for inspection and operation as outlined on DA Form 2258 (Depreservation Guide of Engineer Equipment) secured on of the mixing drum.

##### b. Inspection of equipment.

Make a thorough inspection of the concrete mixer for possible damage incurred during shipment or handling. Inspect the engine fuel, oil, and coolant lines for cracks or loose connections. Tighten loose bolts and replace those that are missing. Visually inspect instruments and controls for signs of damage or insecure mountings. Inspect all areas of the mixer for dents, distortion, or bare and exposed metal surfaces subject to rusting. Make certain the skip cables are not frayed or damaged, and are properly wound on the spools and pulleys. Wipe or flush all dirt, foreign materials, or oil leakage deposits from the mixer. Prepare a written record of all damage incurred as a result of shipping or vandalism. Report any such conditions and damage immediately unrepairable to the proper authority.

##### 9. SERVICING EQUIPMENT

- a. Perform before-operation services listed in paragraph 29.
- b. Install the water tank liquid sight gage (9, Fig. 2) as outlined in steps (5) and (6) of paragraph 147 d.

c. Completely lubricate the concrete mixer in accordance with the Lubrication Order (Fig. 9), being sure to observe the precautionary measures outlined therein. Be sure that all drain plugs are closed tight before adding lubricants.

d. Service the engine fuel tank with a good grade of gasoline which has been tested and is known to be free of impurities. Wipe accumulated dirt from the fuel tank cap and install it securely in place on the tank.

#### WARNING

Do not allow smoking or use of an open flame in the vicinity of the mixer being serviced with gasoline. Always maintain a metal-to-metal contact between the filling container and the engine housing to prevent sparking caused by static electricity.

- g. Service the engine cooling system with water or the proper solution of anti-freeze as specified in Table II. Be sure that the drain plug (7, Fig. 8) is closed. Inspect hoses and connections for signs of coolant leakage. Wipe the radiator cap clean before installing it on the radiator.



TABLE II. FREEZING POINTS, COMPOSITION, AND SPECIFIC GRAVITIES OF MILITARY ANTI-FREEZE MATERIALS.

Lowest expected ambient temp., °F.	Pints of inhibited glycol per gal. of coolant <sup>1</sup>	Compound, anti-freeze, Artic <sup>2</sup>	Ethylene glycol coolant solution specific gravity at 88° F.
+20	1-1/2	Issued full-strength and ready	1.022
+10	2	mixed for 0° to -65° F. temper-	1.036
0	2-3/4	atures for both initial installation	1.047
-10	3-1/4	and replenishment of	1.055
-20	3-1/2	Do not dilute with	1.062
-30	4	water or any other substance.	1.067
-40	4-1/4		1.073
-50	Artic anti-freeze preferred.		

<sup>1</sup> Maximum protection is obtained at 60 percent by volume; that is 4.8 glycol per gallon of solution.

<sup>2</sup> Military Specifications MIL-C-11755 Artic type, non-volatile anti-freeze compound is intended for use in the cooling system of liquid-cooled internal combustion engines

for protection against freezing primarily in Arctic regions where ambient temperature remains for extended periods of time close to -40° F. or drops below, to as low as -90° F.

<sup>3</sup> Use an accurate hydrometer. To test hydrometer, use 1 part ethylene glycol type anti-freeze to 2 parts water. This should produce a hydrometer reading of 0° F.

#### 10. INSTALLATION OR SETTING-UP INSTRUCTIONS

a. Place the concrete mixer as near as possible to the location where the mixed concrete will be needed.

b. Select an area large enough for the personnel to operate the mixer properly.

c. Provide a flat and level surface for supporting the mixer.

d. Block the wheels and adjust the stabilizing legs to reduce vibrations.

e. Provide an ample supply of water to mix the concrete required and to clean and flush the concrete mixer after operation has ceased.

#### 11. MOVEMENT TO A NEW SITE

a. Raise and secure the front and rear stabilizer legs (6 and 4, Figs. 1 and 2) in their up position.

b. Remove all concrete deposits from the interior surfaces of the mixing drum.

c. Securely attach and lock the towing tongue (5) and safety chains (16, Fig. 1) to the prime mover. Test attachment by towing a short distance.

d. Be sure that the skip is secured in its vertical position with hook (17, Fig. 1).

e. Accomplish any procedures or precautionary measures as necessary for the safety of the equipment by reviewing the instructions outlined in Section II of CHAPTER 5.

## Section II. CONTROLS AND INSTRUMENTS

### 12. GENERAL

This section locates, illustrates, and furnishes the operator sufficient information about the controls and instruments for the proper operation of the concrete mixer.

### 13. ENGINE CONTROLS

a. Magneto Switch (Fig. 8). The engine ignition switch (3) is located approximately in the center of the engine front control panel (9). It is a toggle type switch enclosed in a radio suppressed metal case. The purpose of the switch is to open or close the ignition circuit, which allows starting and stopping of the engine.

b. Choke Control (Fig. 8). The engine carburetor choke control (6) is located at the bottom of front control panel (9). It is a manually operated rod connected by cable to the engine carburetor. In operation, movement of the control restricts flow of air entering the carburetor and enriching the fuel mixture.

c. Governor Control (Fig. 3). The engine governor control latch (42) is located at the lower right-hand side of the engine and below the governor (41). It is a pull-type hand control which may be locked at any

desired throttle setting by means of its notched rod. The purpose of the governor control is to regulate and maintain engine speeds as desired. Figure 8 illustrates its accessibility from the front control panel (9).

d. Oil Pressure Gage (Fig. 3). The oil pressure gage (34) is located on the right side of the engine hood. This gage is a needle type instrument calibrated in pounds per square inch of pressure, from zero to sixty pounds. The purpose of this gage is to determine the engine oil pressure. The normal oil pressure reading at operating speed is 10-15 psi (pounds per square inch).

e. Fuel Strainer Shutoff Cock (Fig. 3). The engine fuel shutoff valve (24) is located beneath the fuel tank (1) and is part of the fuel strainer assembly (23). It is a manually operated, needle valve type cock, and its purpose is to stop or shut off the fuel flow from the fuel tank to the fuel pump (83).

f. Engine Electric Starter. The engine is electrically started by depressing the starter button (2, Fig. 8) on the front control panel, after the ignition switch (3) is ON.

g. Engine Auxiliary starting hand crank opening is located below the radiator at the front end of the engine (Fig. 8). With the ignition switch (3, Fig. 8) in its ON position, the engine is manually started by the operator whenever the crank is rotated in a clockwise manner. The hand crank is

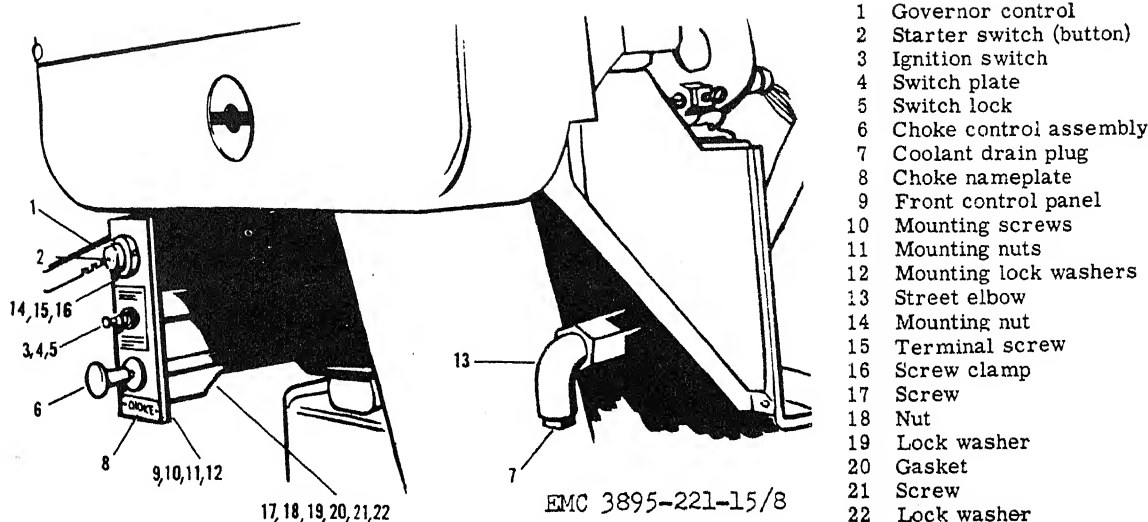


Figure 8. Engine Front Control Panel.

stored in the tool box and is only used when the electric starter is inoperative.

#### 14. MIXER CONTROLS

a. Water Level Sight Gage and Valves (Fig. 2). Mounted at the top and bottom of the liquid level gage (9) are two angle valves (10 and 11). These manually-operated valves control the flow of water into the gage glass, and may be shut off in the event of glass breakage. Guardrods (12) are mounted on either side of the gage glass to protect it against breakage. The purpose of the gage is to allow immediate visual indication of the water level or supply within the water tank (7, Fig. 1).

b. Water Volume Control (Fig. 1). The water volume control (12) consists of an integral handle and indicator, locking thumb-screw, and a dial plate calibrated in both pounds and gallons. In operation, the thumbscrew is loosened, the handle is moved so that the desired amount of water in either gallons or pounds, is underlined by the indicator, and then secured in place by tightening the thumbscrew. Movement of the handle actuates a bellows within the water tank, which in turn limits or regulates the amount of water to be siphoned into the mixing drum whenever the freeway valve (13) is opened to discharge position.

c. Skip Clutch Lever (Fig. 1). The skip clutch control lever (15) is located on the forward, right side of the mixer and is distinguished as the longer of the two levers located

at this position. The purpose of this manually operated lever is to engage and disengage the skip clutch, which allows raising of the skip.

d. Skip Brake Lever (Fig. 1). The skip brake control lever (14) is the shorter of the two levers located at the forward, right side of the concrete mixer. The purpose of this manually operated lever is to control the lowering of the skip. Upon raising the skip, the skip brake is automatically engaged when the skip clutch is disengaged.

e. Master Clutch Control (Fig. 1). The master clutch control (18) is located on the left side, front end of the mixer and next to the clutch housing. Actuation of this hand control engages and disengages the engine driven shaft and sprocket with the drum drive chain, resulting in rotation of the drum.

f. Discharge Chute Handwheel (Fig. 2). The discharge chute handwheel (6) is located at the rear, right side of the concrete mixer. Manual rotation of the handwheel in a counter-clockwise direction lowers the discharge chute (1), and rotation in the opposite direction will raise the chute.

g. Freeway Valve Lever (Fig. 1). The freeway valve lever (19) allows water to flow from the pump into the water tank (7) when in its up position (shown). Moving the lever forward and down 180°, allows the metered amount of water to flow from the tank and into the revolving drum. When flow ceases, lever is raised forward and up to its original position, refilling tank (7).

### Section III. OPERATION UNDER USUAL CONDITIONS

#### 15. GENERAL

a. The instructions in this section are published for use by the personnel responsible for the operation of the concrete mixer.

b. It is essential that the operator read and understand the instructions contained herein. Only by being completely familiar with the instructions will the operator be capable of performing every operation required of the concrete mixer.

#### 16. STARTING

##### a. Preparation for Starting.

(1) Perform the before-operation services outlined in paragraph 29.

(2) Be sure that the mixer is in a level position; and lower the front and rear stabilizer legs (6 and 4, Figs. 1 and 2).

(3) Position the freeway valve lever (19, Fig. 1) to tank fill (UP) position the water volume control (12, Fig. 1) to the amount desired to be discharged into the drum, and raise the discharge chute (1, Fig. 2) to its closed position (UP).

##### b. Starting the Engine.

(1) Open the engine fuel strainer shutoff valve (24, Fig. 3).

(2) Lift up and pull out the governor control latch (42, Fig. 3) so that the fourth notch of the notched portion of the rod is engaged in its keeper.

(3) Raise the ignition switch (3, Fig. 8) toggle to ON.

(4) Pull the choke control (6, Fig. 8) out, depress the engine starter button (2, Fig. 8), and repeat process until engine fires.

(5) When the engine starts and warms up to operating temperature, gradually push the choke control in.

(6) Allow the engine to run at this speed with the choke in at operating position for at least three minutes. Then lift the governor control latch (42, Fig. 3), move it in, and run the engine at full throttle for two minutes more to bring it up to operating temperature.

##### c. Starting the Mixer.

(1) Disengage hook (17, Fig. 1) unlocking the skip (1) from its vertical position. Move the skip brake control lever (14, Fig. 1) forward (away from drum), lower skip, but bring it to a complete stop about a foot above the ground and then slowly lower it completely. This keeps the cable taut and prevents cable fouling on the drums. Rotate the discharge chute handwheel so that the chute outer end is pointing upward.

(2) Start the engine as outlined in paragraph 16b.

(3) Engage the engine by moving the master clutch control lever (18, Fig. 1) in toward the engine. Move clutch control lever (15, Fig. 1) forward, and raise skip.

#### NOTE

Always engage skip clutch slowly. Skip clutch Automatically disengages when skip strikes knock-out lever (20, Fig. 1). This also engages the skip brake, making it unnecessary to brake the skip manually when raised.

#### WARNING

While the drum is rotating, never allow objects or any parts of the body in or near the drum. If adjustments are necessary, always stop the engine.

(4) Before operation, test the skip clutch and brake, and take slack out of the cables by slowly lowering and raising the skip.

#### WARNING

Prior to operating the skip, be sure that the area above, below, and around the skip is clear of obstructions and personnel.

#### 17. STOPPING

##### a. Stopping the Mixer.

(1) Raise or lower the skip. For short shutdown periods, the skip may be in either the up or down position for extended periods, the skip must be raised to its vertical position.

(2) Disengage the engine drive by pulling the master clutch control lever (18, Fig. 1) away from the engine.

(3) Stop the engine as outlined in paragraph 17b.

(4) Raise the discharge chute (1, Fig. 2) to the up or mixing position. Lock the skip in up position with hook (17, Fig. 1) provided.

(5) Perform the after-operation or at-halt services listed in paragraph 29.

##### b. Stopping the Engine.

(1) Run the engine with no load at idle speed for five minutes to allow for even cooling.

(2) Stop the engine by moving the ignition switch (3, Fig. 8) toggle down to OFF.

(3) Close the fuel strainer shutoff valve (24, Fig. 3).

#### 18. OPERATING DETAILS

a. General. In addition to the basic starting and stopping instructions outlined in paragraphs 16 and 17, the

following detailed instructions will apply for complete engine and mixer operation, and are listed in the sequence or order in which they are normally performed.

b. Setting Water Volume Control (Fig. 1). Upon knowing the water to dry material ratio for the concrete consistency desired, loosen the thumbscrew, move the quadrant handle so that amount required etched on the measuring plate is underlined by the crosspiece of the quadrant, and then tighten the thumbscrew. This exact amount of water will repeatedly be siphoned and discharged into the mixing drum for each batch until the quadrant handle is relocated to a new position over the measuring plate.

c. Filling the Water Tank (Fig. 1). In order to fill the water tank (7), the suction end of the pump (13, Fig. 2) must be connected to an external supply source, the engine must be running to drive the pump, the angle valves (10 and 11, Fig. 2) of the sight gage (9, Fig. 2) must be open, and the freeway valve lever (19) must be in the up position. Prime pump, if necessary, by filling with water at priming cap (13, Fig. 30).

d. Loading the Skip. Cover the bottom of the skip evenly with stone or gravel, add the required amount of cement, and then add the sand. This arrangement prevents loss of cement through winds or careless handling, keeps the drum interior clean and scoured upon contact with the gravel, prevents packing or sticking of materials, and insures complete intermixing of all components as the water is added.

e. Discharging Water into Mixing Drum. It is important that some water reaches the mixing drum a few seconds before the dry materials. The purpose of this is to wash off wet concrete from within the drum, prevent buildup, and provide a more thorough distribution of water to the dry materials as they are added. Water is released from the water tank (7, Fig. 1) and into the drum by moving the freeway valve lever (19, Fig. 1) down and toward the drum. Only the amount of water indicated on the volume control (12, Fig. 1) will be discharged into the drum.

f. Hoisting Skip. Immediately after starting the water into the drum, push the skip clutch control lever (15, Fig. 1) in toward the drum. This action will raise the loaded skip to its vertical position, bring the skip shaker rollers (10, Fig. 1) into contact with the lugs of the revolving drum opening drip ring (11, Fig. 1) causing the entire contents of the skip to be emptied into the drum. The skip clutch knockout lever (20, Fig. 1) will automatically disengage the skip clutch and engage the skip brake as the skip reaches its vertical position.

g. Mixing Batch. For most effective mixing action, the drum rpm should be in accordance with the manufacturer's information plate (Fig. 5) under maximum load conditions. An empty drum will rotate approximately two revolutions faster than the recommended speed. Correct any differences between actual and specified drum speeds with governor control latch (42, Fig. 3).

h. Releasing Skip. As one batch begins to mix, return the skip to the ground for reloading. To release the skip, slowly move the skip brake control lever (14, Fig. 1)

forward and away from the drum. Bring the skip to a complete stop (move lever towards drum) before it reaches the ground, and then slowly let it continue down until it can go no further. This action will keep the cable taut and prevent fouling on the winding drums.

i. Refilling Water Tank and Skip. When more than one batch is to be mixed consecutively, the water tank and skip are to be re-loaded as outlined in paragraphs c and d above, for each of the succeeding identical batches. When it is necessary to alter the water to dry material ratio for varying degrees of concrete consistency, change the water volume control setting per paragraph b above, and then continue with steps c and d.

j. Discharging Concrete from Mixer. When it has been determined that concrete is uniformly and thoroughly mixed, lower the discharge chute (1, Fig. 2) by rotating the handwheel (6, Fig. 2) in a counterclockwise direction. The amount discharged may be regulated by raising and lowering the discharge chute as needed.

k. Mixing Additional Batches. Immediately upon discharging the entire contents of one batch (par. j above), and having completed instructions of par. i. above, repeat the procedures outlined in paragraphs e, f, and g. Employing this system of loading and discharging, will utilize the maximum operating efficiency of the concrete mixer.

l. Intermittent Mixing. Whenever there are long intervals between mixing of batches, the drum interior must be flushed down with water. This is especially important during hot weather operation or when using heated materials in extreme cold weather. As a general rule, any time exceeding 45 minutes under normal conditions will require flushing of the drum.

## 19. MOVEMENT TO A NEW LOCATION

### a. Preparation for Movement.

(1) Flush the drum interior, clean all exterior surfaces of the mixer, raise the discharge chute, and secure the skip in its vertical position with the hook (17, Fig. 1) provided.

(2) Remove the water pump suction hose from the external source of water, drain the engine fuel tank at drain cock (13, Fig. 3) close the fuel strainer shutoff valve (24, Fig. 3) and install the engine side panel in place if it had been removed.

(3) Loosen, raise, and secure the stabilizer legs (6 and 4, Fig. 1 and 2) in their uppermost position.

(4) Inspect the towing tongue and chains (5 and 16, Fig. 1) and be sure that they are in a clean and usable condition.

(5) Close the sight gage angle valves (10 and 11, Fig. 2).

### b. Towing.

(1) Secure the towing tongue (5, Fig. 1) to the towing vehicle connection. Whenever the mixer is to be moved,

take the precaution of connecting safety chains (16, Fig. 1) from the mixer to the towing vehicle.

(2) Do not tow the mixer at speeds which exceed the MPH indicated on the data plate (Fig. 5), prevailing traffic, weather or road conditions. The operator of the towing vehicle must be made aware of the fact that the mixer does

not have wheel brakes, and must regulate his driving accordingly.

c. Setting up at New Location. Disconnect the safety chains and the towing tongue from the towing vehicle after locating the mixer near a source of water and a level terrain. Accomplish the equipment servicing procedures of paragraph 9.

#### Section IV. OPERATION UNDER UNUSUAL CONDITIONS

##### 20. OPERATION IN EXTREME COLD

###### a. Engine.

(1) Fill the fuel tank frequently and be sure that the tank is full at the end of the day's operation. Keeping the tank full will prevent moisture condensation from forming within the fuel tank. Use a winter grade gasoline, or one that has an anti-freeze additive.

(2) Service the fuel strainer (23, Fig. 3) daily (par. 57b) and remove any water which may have accumulated.

(3) Inspect the spark plugs (4, Fig. 4) frequently and wipe away moisture or foreign matter found on them.

(4) Be sure that the engine is lubricated for winter operation in accordance with the Lubrication Order (Fig. 9).

(5) When starting the engine in extreme cold, be sure to allow it to reach normal operating temperature before applying any load.

(6) Be sure that the cooling system has been serviced with the specified anti-freeze mixture (Table II) for the lowest expected operational temperature range. If anti-freeze protection solution is not available, be sure to drain the radiator after each day's operation by removing plug (7, Fig. 8). Before adding the initial anti-freeze mixture, drain, clean and flush the entire cooling system; inspect condition of hoses and secureness of hose clamps. Never flush a cold system in freezing weather. If the mixer cannot be serviced indoors, be sure that the engine has reached operating temperature so that the flushing agent does not freeze upon contact with the cold metal.

###### b. Mixer.

(1) When operating the mixer at intermittent intervals in extreme cold temperatures, be sure to drain all water from the water tank, tank gage, water valve, and auxiliary water pump.

(2) Remove drain plugs from the above components, drain off water, and re-install plugs tightly.

(3) Clean and flush out the mixer drum frequently, especially when using heated materials. Be sure to drain all water from the drum after flushout is complete.

(4) Lubricate the mixer in accordance with Lubrication Order (Fig. 9) as specified for the prevailing temperatures. Keep lubrication points clean of dirt;

prevent lubricants from contacting water or excessive moisture.

##### 21. OPERATION IN EXTREME HEAT

###### a. Engine.

(1) Keep all areas of the engine clean of oil deposits and dust. Frequently check the coolant level and add water as necessary; when water becomes discolored, drain, flush, and refill using a rust inhibitor if available. Use only clean soft water and a clean container to pour it from. Hard water will create lime scale, and rust deposits in the radiator, which would reduce the efficiency of the entire system. Check engine fan V-belt for proper tension (par. 66e).

(2) Lubricate the engine in accordance with the Lubrication Order (Fig. 9) and prevailing temperatures.

###### b. Mixer.

(1) Always maintain the exterior surfaces of the mixer in a clean, dust free condition; use a stiff brush and flush with water. Whenever the interval between batches is to exceed 30 minutes, flush out the mixing drum immediately.

(2) Lubricate the mixer in accordance with the Lubrication Order (Fig. 9) and prevailing temperatures.

##### 22. OPERATION IN DUSTY OR SANDY AREAS

###### a. Engine.

(1) Service the cooling system as outlined in paragraph 21a (1).

(2) Increase the frequency of lubrication service as conditions demand. Service and clean the air cleaner (par. 56b) and the engine crankcase filler cap (22, Fig. 34) daily. Store all lubricants as instructed.

(3) Clean the fuel sediment bowl and strainer screen daily as outlined in paragraph 57b.

###### b. Mixer.

(1) Maintain a clean mixer exterior (par. 21b (1)).

(2) Increase the frequency of lubrication services to the concrete mixer as outlined in the Lubrication Order (Fig. 9).

## 23. OPERATION IN SALT WATER OR HIGH HUMIDITY AREAS

a. **Salt Water Areas.** When possible, locate the mixer so that it is protected from salt water by natural barriers, otherwise, erect a barrier from available materials for salt water spray protection. Flush the entire mixer down with fresh water frequently and wipe dry.

b. **High Humidity Areas.** During extended shutdown periods, completely cover the mixer with a canvas or water-proof material. Protect exposed and unpainted areas from rusting by applying paint as soon as practicable. During sunny or drier periods, remove the engine side panels and allow the engine to dry out. Wipe the engine and skip

loader clutch controls dry before operating. Fill the fuel tank frequently, and be sure that it is full at the end of day's operation to prevent condensation. Service the fuel strainer daily (par. 57b) and increase the frequency of lubricating services required in the Lubrication Order (Fig. 9).

## 24. OPERATION AT HIGH ALTITUDES.

If the engine operates sluggishly or shows signs of reduced power for no mechanical reason, reduce the amount of each batch to be mixed in the drum. Make certain that the engine choke control (6, Fig. 8) is in operating position and is not closed when the engine is running.

## Section V. OPERATION OF AUXILIARY MATERIAL USED IN CONJUNCTION WITH THE END ITEM

### 25. FIRE EXTINGUISHER (Monobromotrifluoromethane Type)

a. **Description.** The monobromotrifluoromethane type fire extinguisher replaces the carbon dioxide and carbon tetrachloride type fire extinguishers used in the past. It is generally suitable for use on all types of fires, with the exception of fires involved with LOX (liquid oxygen generating) equipment. The fire extinguisher is furnished with a disposable type cylinder.

b. **Operation.** To operate the fire extinguisher, perform the following operations:

- (1) Unfasten the snap clamp and remove fire extinguisher from its location.
- (2) Break the seal by pulling the safety pin from the handle.
- (3) Point the horn at the base of the flame.
- (4) Depress trigger for discharge and direct the stream of contents at the base of the fire.

**WARNING:** Avoid breathing of  
Smoke.

- (5) Replace with new cylinder immediately after using.

c. **Replacement of Cylinder.** To replace with new cylinder, perform the following operations:

- (1) Press lever to release pressure from old cylinder.
- (2) Loosen swivel valve coupling nut and remove the valve assembly from used cylinder.
- (3) Remove instruction band from used cylinder.
- (4) Place new cylinder through the instruction band.
- (5) Replace safety pin in valve and seal pin with sealing wire.
- (6) Attach valve assembly and tighten swivel coupling nut on the new cylinder and replace fire extinguisher in mounting bracket.
- (7) Adjust instruction band on cylinder to show maintenance and operation instructions.

d. **Maintenance.** Weigh fire extinguisher every three months and replace cylinder if gross weight has decreased 4 ounces or more. Lubricate cylinder neck threads with one drop of OE 30 oil before reassembly.

## CHAPTER 3

### OPERATOR, CREW AND ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

#### Section 1. SPECIAL TOOLS AND LUBRICATION

##### 26. TOOLS AND EQUIPMENT

No special tools or equipment is required for maintenance of the concrete mixer by personnel of the organizational level for whom the instructions of this chapter is intended.

##### 27. LUBRICATION INFORMATION

a. General. The Lubrication Order (Fig. 9) illustrates the location of points which require lubrication, and lists the lubrication service and interval which are the responsibility of the operating and organizational maintenance personnel. Intervals specified are for normal operating conditions. Increase or decrease these time intervals as weather and operating conditions require. Change lubricant grade only when temperature is in a consistently higher or lower range than that which the equipment is serviced for at the time.

##### b. Detailed Instructions.

(1) Care of Lubricants. Keep all lubricants (grease and oil) in closed containers and stored in a clean, dry

place away from any external heat. Do not allow dirt, dust, water, or foreign materials to contact the lubricants. Maintain lubricating equipment in a clean, ready to use condition.

(2) Points of Application. Figure 9 indicates the points which require lubrication. Service these points in accordance with the Lubrication Order and using only the lubricants specified therein.

(3) Cleaning. Wipe all lubrication points clean before lubricating; remove excess lubricant from the points and wipe clean any oil drippage upon completing service. Accumulations of old, heavy grease may be removed by scraping or by using an approved cleaning solvent.

(4) Operation After Lubrication. Immediately after completing lubrication services, operate the engine, mixer, and the skip. Observe the oil filter, lines, and connections for signs of leakage. If the engine crankcase oil was changed, allow the engine to run for at least five minutes and then recheck the oil level; add as required.



**LUBRICATION  
ORDER**

# LO 5-3895-221-15-1

(Supersedes LO 5-3895-221-20 dated 18 October 1961)

**MIXER, CONCRETE, TRAILER MOUNTED: GASOLINE  
DRIVEN; 16 CU FT (CHAIN BELT MODEL HBG)  
W/ENGINE HERCULES MODEL IXB-3ER**

Reference: LO 5-3895-221-15-2, SM 10-1-C4-1

Intervals are based on normal hours of operations. Reduce to compensate for abnormal operations and severe conditions. During inactive periods, sufficient lubrication must be performed for adequate preservation.

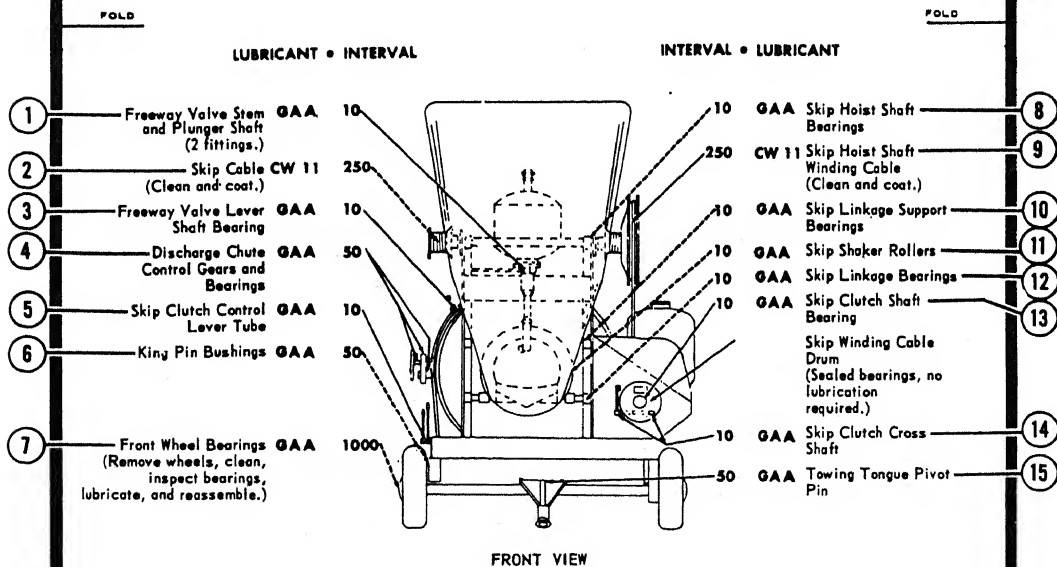
Clean fittings before lubricating.

Relubricate after washing or fording.

Clean parts with SOLVENT, dry-cleaning, or with OIL, fuel, Diesel. Dry before lubricating.

Drain gearcase when hot. Fill and check level.

Lubricate points indicated by dotted arrow shafts on both sides of equipment.



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FOLLOWING PAGE

EMC 3895-221-15/9 ①

Figure 9①. LUBRICATION ORDER.

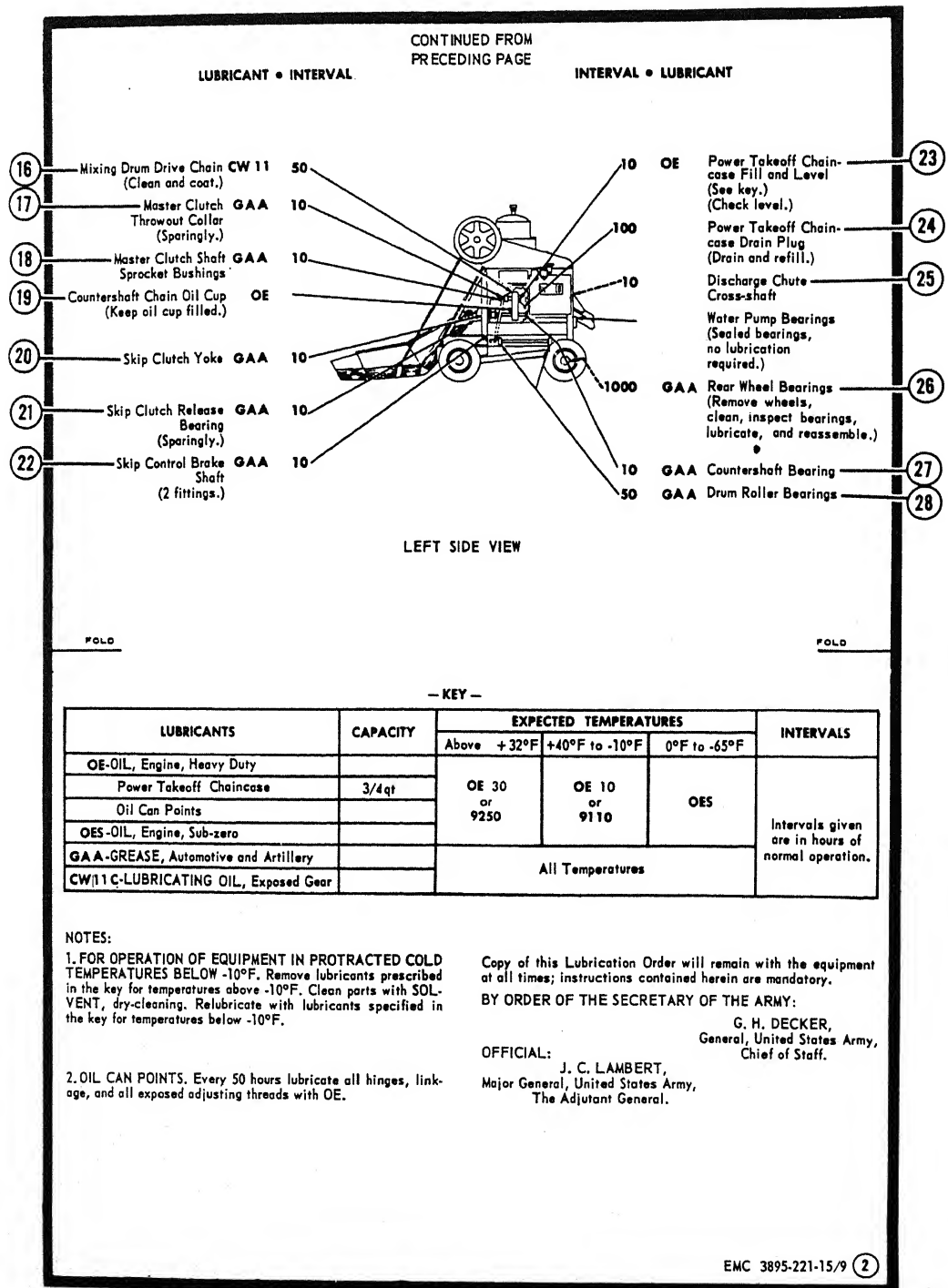


Figure 9②. LUBRICATION ORDER—Continued.

**LUBRICATION  
ORDER**

# LO 5-3895-221-15-2

(Supersedes LO 5-3895-221-20 dated 18 October 1961)

**MIXER, CONCRETE, TRAILER MOUNTED: GASOLINE  
DRIVEN: 16 CU FT (CHAIN BELT MODEL HBG)  
W/ENGINE HERCULES MODEL IXB-3ER**

Reference: LO 5-3895-221-15-1, SM 1G-1-C4-1

Intervals are based on normal hours of operations. Reduce to compensate for abnormal operations and severe conditions. During inactive periods, sufficient lubrication must be performed for adequate preservation.

Clean fittings before lubricating.

Relubricate after washing or fording.

Clean parts with SOLVENT, dry-cleaning, or with OIL, fuel, Diesel. Dry before lubricating.

A dotted circle indicates a drain below.

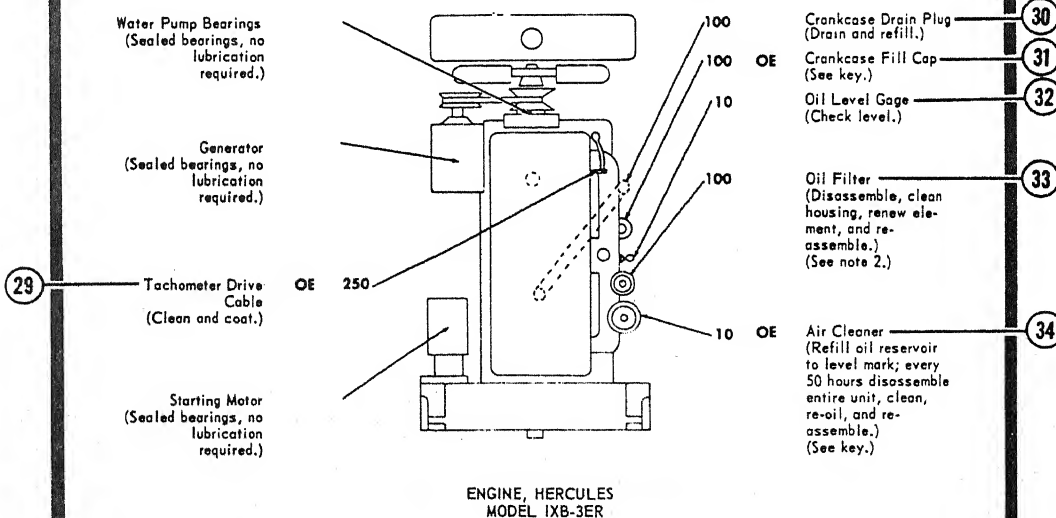
Drain crankcase when hot. Fill and check level.

FOLO

FOLO

**LUBRICANT • INTERVAL**

**INTERVAL • LUBRICANT**



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FOLLOWING PAGE

EMC 3895-221-15/9 (3)

Figure 9③. LUBRICATION ORDER—Continued.

CONTINUED FROM  
PRECEDING PAGE

— KEY —

LUBRICANTS	CAPACITY	EXPECTED TEMPERATURES			INTERVALS
		Above +32°F	+40°F to -10°F	0°F to -65°F	
OE-OIL, Engine, Heavy Duty					
Crankcase	5-1/2 qt	OE 30 or 9250	OE 10 or 9110	OES	Intervals given are in hours of normal operation.
Air Cleaner	3/4 qt				
Oil Can Points					
OES-OIL, Engine, Sub-zero					

NOTES:

1. FOR OPERATION OF EQUIPMENT IN PROTRACTED COLD TEMPERATURES BELOW -10°F. Remove lubricants prescribed in the key for temperatures above -10°F. Clean parts with SOLVENT, dry-cleaning. Relubricate with lubricants specified in the key for temperatures below -10°F.
2. OIL FILTER. After installing new filter element, fill crankcase, operate engine 5 minutes, check housing for leaks, check crankcase oil level, and bring to full mark.
3. OIL CAN POINTS. Every 50 hours lubricate throttle and governor linkage, pins, clevises, and all exposed adjusting threads with OE.

Copy of this Lubrication Order will remain with the equipment at all times; instructions contained herein are mandatory.

BY ORDER OF THE SECRETARY OF THE ARMY:

G. H. DECKER,  
General, United States Army,  
Chief of Staff.

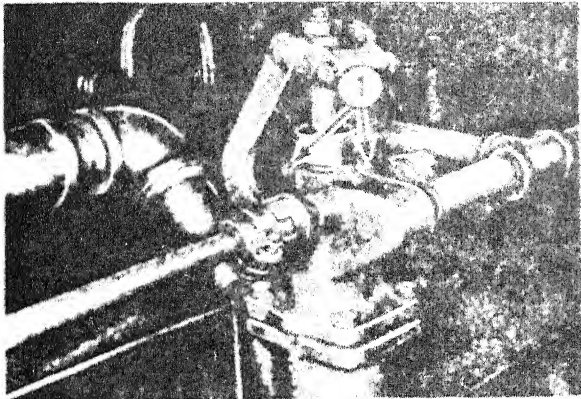
OFFICIAL:  
J. C. LAMBERT,  
Major General, United States Army,  
The Adjutant General.

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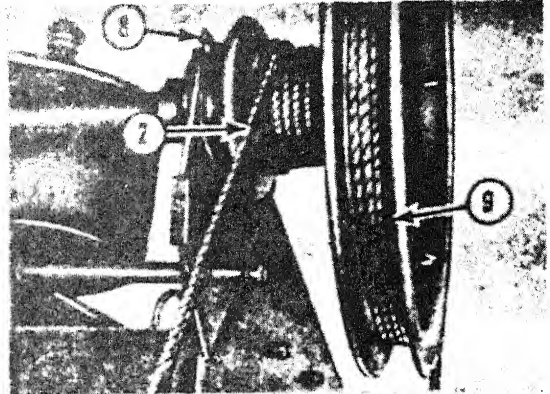
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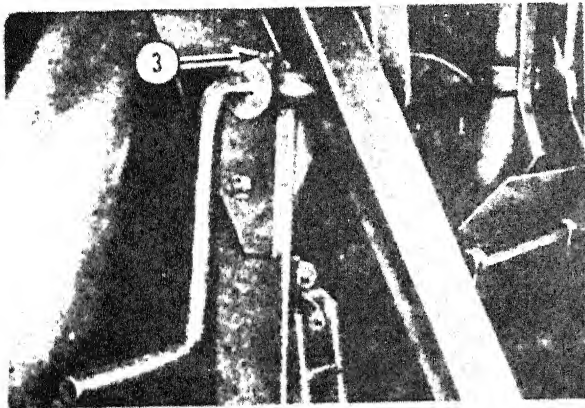
Figure 9④. LUBRICATION ORDER—Continued



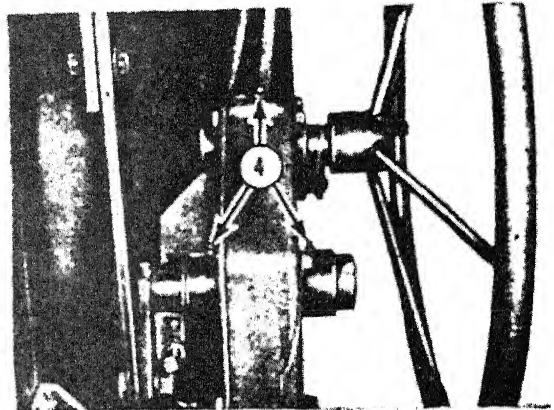
REF. 1. FREEWAY VALVE STEM AND  
PLUNGER SHAFT



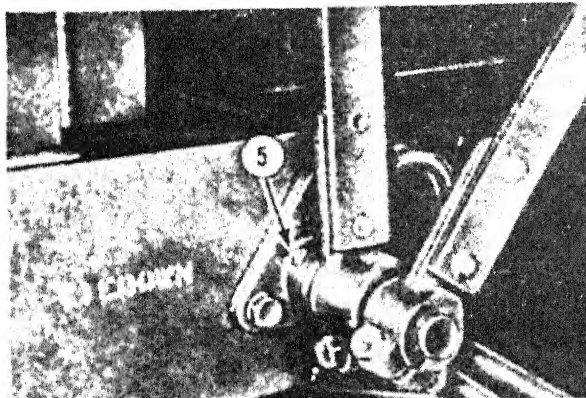
REF. 2. SKIP CABLE  
REF. 3. SKIP HOIST SHAFT BEARINGS  
REF. 4. SKIP HOIST SHAFT WINDING CABLE



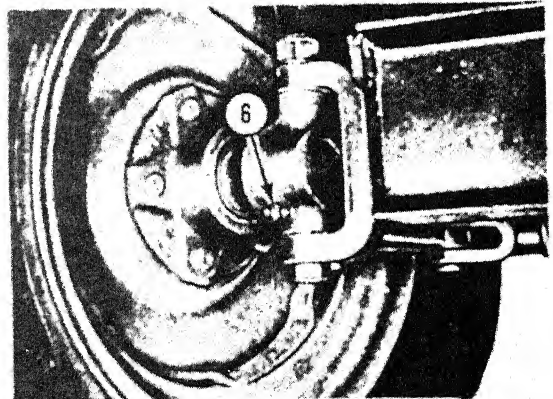
REF. 5. FREEWAY VALVE LEVER  
SHAFT BEARING



REF. 6. DISCHARGE CHUTE  
CONTROL GEARS AND  
BEARINGS.



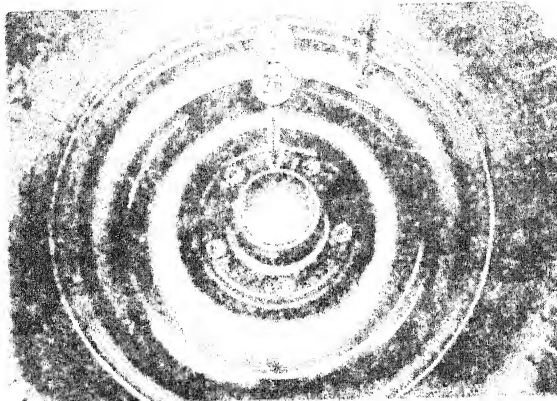
REF. 7. SKIP CLUTCH CONTROL  
LEVER TUBE



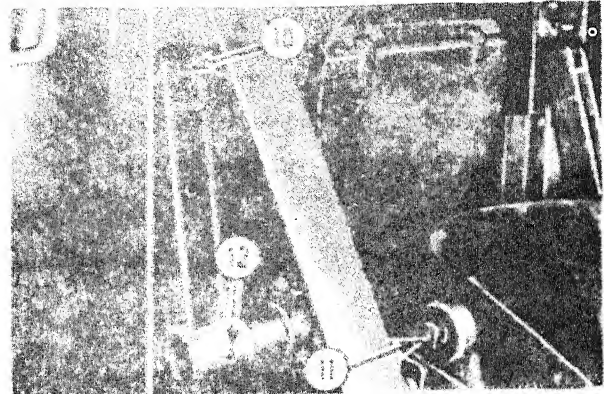
REF. 8. KING PIN BUSHINGS

Figure 9⑥. LUBRICATION ORDER—Continued.

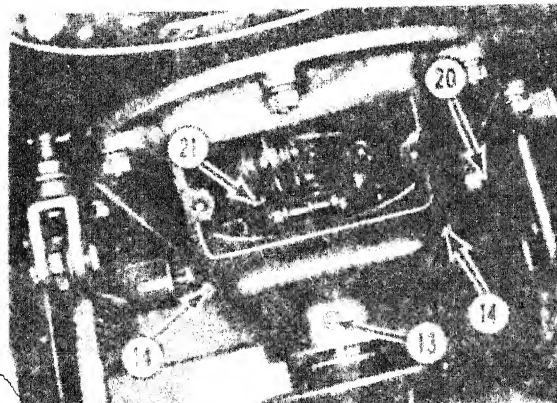
EMC 3895-221-15/9 ⑤



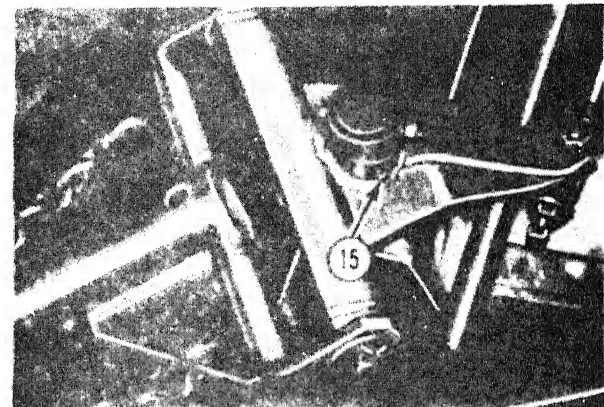
REF. 10. WHEEL BEARING.  
REF. 11. WHEEL ROLLER.



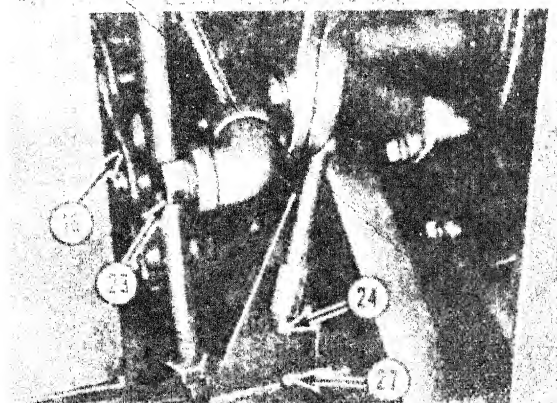
REF. 10. LINKAGE SUPPORT  
POSITION.  
REF. 11. ROLLER ROLLERS.  
REF. 12. LINKAGE BEARING.



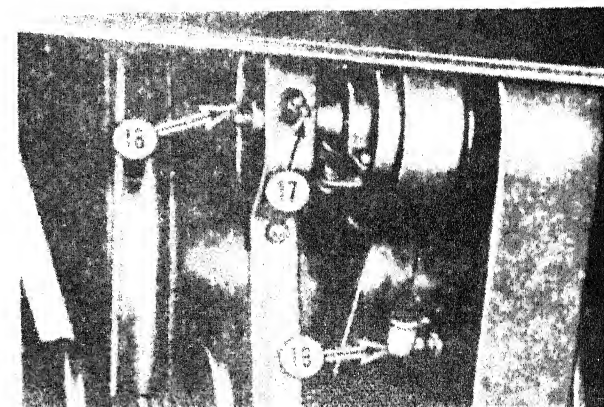
REF. 13. WHEEL ROLLER BEARING.  
REF. 14. WHEEL ROLLER.  
REF. 15. WHEEL ROLLER.  
REF. 16. WHEEL ROLLER BEARING.



REF. 15. TONGUE PIVOT PIN.



REF. 16. DRIVE CHAIN DRIVE CHAIN.  
REF. 17. DRIVE CHAIN DRIVE CHAIN.

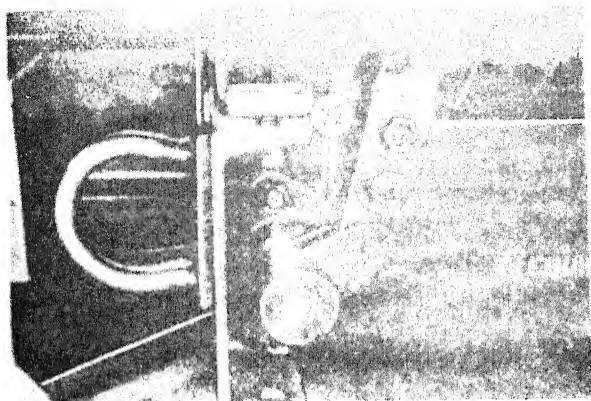


REF. 17. DRIVE CHAIN DRIVE CHAIN.  
REF. 18. DRIVE CHAIN DRIVE CHAIN.  
REF. 19. DRIVE CHAIN DRIVE CHAIN.

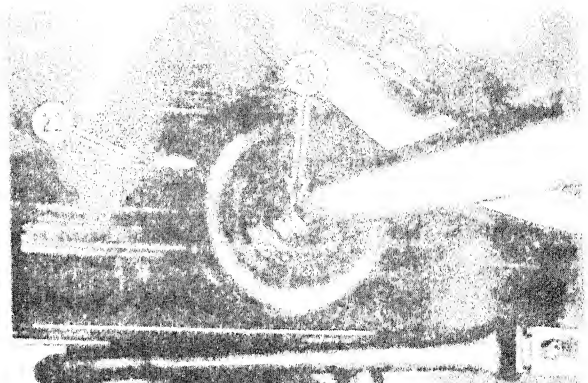
Figure 9(8) LUBRICATION ORDER—Continued.

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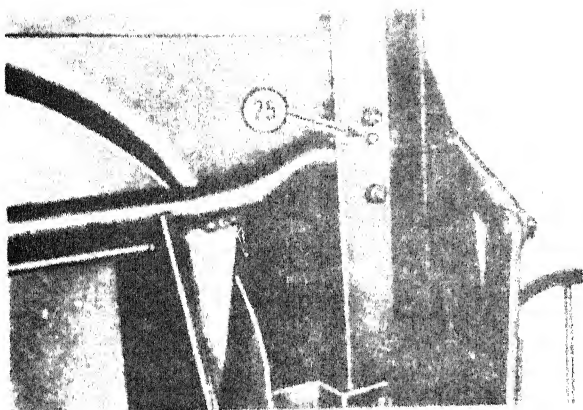


REF. 27. SLIP CONTROL DRIVE SHAFT.

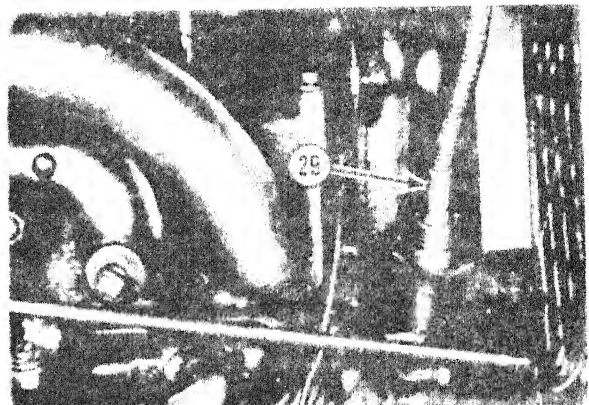


REF. 27. SLIP CONTROL DRIVE SHAFT.

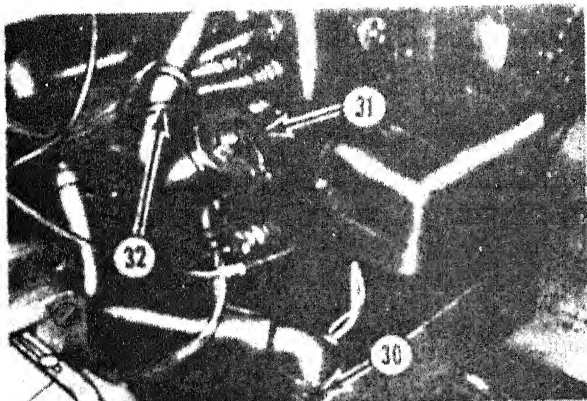
REF. 28. DISCHARGE ROLLER BEARING.



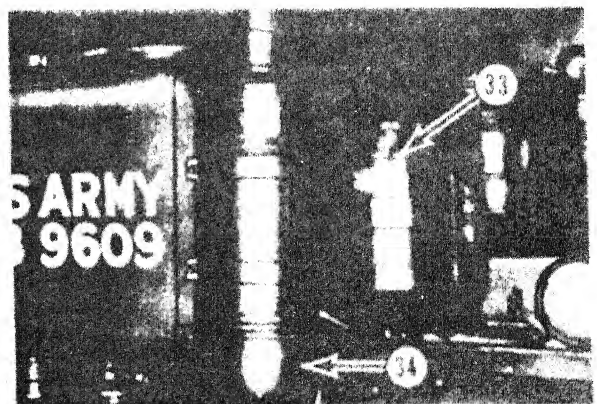
REF. 28. DISCHARGE ROLLER CROSS-SHAFT.



REF. 29. TACHOMETER DRIVE CABLE.



REF. 30. CRANKCASE DRAIN PLUG.  
REF. 31. CRANKCASE FILL CAP.  
REF. 32. OIL LEVEL GAGE.



REF. 33. OIL FILTER.  
REF. 34. AIR CLEANER.

Figure 9⑦. LUBRICATION ORDER—Continued.

EMC 3895-221-15/⑦

## Section II. OPERATOR, CREW AND ORGANIZATIONAL PREVENTIVE MAINTENANCE

### 28. GENERAL

To insure that the equipment is ready for operation at all times, it must be inspected systematically before operation, during operation, at halt, and after operation, so that defects may be discovered and corrected before they result in serious damage or failure. The necessary preventive maintenance services will be performed before operation. Defects discovered during operation of the unit will be noted for future correction, to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noticed during operation which could damage the equipment if operation were continued. After operation

services will be performed by the operator after every operating period. After-operation services will be performed at intervals based on the normal daily operation cycle of the equipment. Reduce interval to compensate for abnormal conditions. Defects or unsatisfactory operating characteristics beyond the scope of the operator to correct must be reported at the earliest opportunity to Organizational Maintenance. Responsibility for performance of preventive maintenance services rests not only with the operator, but with the entire chain of command from section chief to commanding officer (AR 750-5).

### 29. OPERATOR'S DAILY SERVICES

Interval			
Before Operation	During Operation	After Operation	
X	.....	X	<u>Fuel.</u> Inspect the fuel supply. See that the gasoline tank is full.
X	.....	X	<u>Oil.</u> Inspect the oil level in the crankcase. Add oil if necessary. (LO 5-3895-221-15).
X	.....	X	<u>Lubrication.</u> Inspect the moving parts of the mixer. Lubricate as necessary (LO 5-3895-221-15).
X	.....	X	<u>Coolant.</u> Inspect coolant level in the radiator. Add coolant if necessary. When filling a cooling system containing anti-freeze, allow room for expansion.
X	X	X	<u>Instruments.</u> Inspect all instruments and gages for broken glass and insecure mountings.
.....	X	.....	<u>Gage readings.</u> Inspect all instruments and gages for proper function when operating mixer.
X	X	X	<u>Visual inspection.</u> Make a general inspection of the entire mixer for any obvious deficiencies such as oil or water leaks, and loose and missing bolts and nuts. Correct or report deficiency to organizational maintenance.
.....	X	.....	<u>Unusual noises or operation.</u> Inspect for unusual noises or operation, overheating, breakage, and worn parts. Inspect for overheated bearings, clutches, and brake bands. Report deficiencies or irregularities to organizational maintenance.
X	X	X	<u>Wire rope.</u> Inspect the wire rope (skip cables) for signs of damage and wear. Be sure wire ropes are coiling evenly when drums are rotated.
.....	.....	X	<u>Drum.</u> Inspect interior of drum after aggregate discharge. Contents should be completely removed. Flush with water when operation is complete.
X	X	X	<u>Skip.</u> Inspect skip for materials remaining after being raised to its discharge (vertical) position. Scrape and wash with jets of water.
X	.....	X	<u>Water tank.</u> Inspect for proper filling and discharge of water. Maintain required supply in tank.
X	.....	.....	<u>Fire extinguisher.</u> Inspect (weigh) fire extinguisher for full charge. Report any deficiencies to organizational maintenance.
X	.....	.....	<u>Starting precautions.</u> See that all moving parts of the mixer are clear of tools obstructions, and personnel. Disengage the engine clutch, start the engine, allow it to warm up, and then engage the engine clutch. Be sure that mixer is located on firm, level terrain, and that stabilizer legs have been lowered and secured.
.....	.....	X	<u>Protection.</u> Install and secure all doors and covers in place. If mixer must be exposed to the weather, the engine, engine clutch, and drive shaft housing must be protected with a canvas or suitable material. If there is danger of freezing weather, drain water from the water tank, water sight gage, and the water pump. If anti-freeze is not available, drain coolant from the engine radiator. Run the engine at idle approximately 30 seconds to make sure all water is completely drained. Tag the ignition switch with a statement that the cooling system has been drained.



### 30. QUARTERLY PREVENTIVE MAINTENANCE SERVICES

#### 31. ORGANIZATIONAL MAINTENANCE

a. Preventive maintenance is performed by organizational maintenance personnel at quarterly intervals or a maximum of 250 hours of use, whichever occurs first.

b. The preventive maintenance services to be performed at these regular intervals are listed and described in paragraph 32. The numbers appearing at the columns opposite each service refer to a corresponding number appearing on the DA Form 464, and indicate that a report

of the services should be made at that particular number of the form. This number appears in the second column as an indication of the interval at which the service is to be performed. The first column headed "Inspection", is provided for the information of the person performing the inspection. A number in this column indicates that an inspection should be made of the listed items in accordance with the instructions given in the text opposite. The indicated items and instructions constitute the minimum inspection requirements for the equipment.

#### 32. QUARTERLY SERVICE

Inspection	Service Quarterly	
GENERAL		
1	1	<u>Before-operation services.</u> Check and perform the daily services listed in paragraph 29.
2	2	<u>Lubrication.</u> Inspect the entire concrete mixer for missing or damaged lubrication fittings, oil lines, and oil cups and for indications of insufficient lubrication. Check the lubricant level in the engine crankcase. Check for lubricant leaks from all oil lines, engine oil pan, and for defective oil seals. Check to see that the current lubrication order is on the concrete mixer and is in legible condition. Refer to DA Pam 310-4 for date of latest issue.
	2	Lubricate the concrete mixer according to the current lubrication order. Replace any illegible or outdated lubrication orders. Correct other deficiencies noticed or report the condition to the proper authority.
3	3	<u>Tools and equipment.</u> Inspect the condition of all tools and equipment assigned to the concrete mixer. Check the condition and mounting of the toolbox.
	3	See that all tools and equipment assigned to the generator are clean, serviceable, and properly stowed or mounted. See that the toolbox is in good condition.
5	5	<u>Publications.</u> See that copies of this technical manual are on the equipment and in legible condition.
6	6	<u>Appearance.</u> Inspect the general appearance of the concrete mixer, paying particular attention to cleanness, legibility of identification markings and condition of the paint.
	6	See that any deficiencies noticed are corrected or reported to the proper authority.
ENGINE AND ACCESSORIES		
11	11	<u>Cylinder head, manifolds, and gaskets.</u> Inspect the cylinder head and manifolds for cracks, breaks, loose mounting bolts, stud nuts, and for defective gaskets.
	11	Replace any defective parts, and tighten loose mounting bolts and stud nuts. During the quarterly servicing of new or reconditioned engines, check all of the head mounting bolts for tightness after warming up the engine to operating temperatures. The correct torque-wrench pull is 50 foot-pounds.
12	12	<u>Valve mechanism.</u> Check valve adjustments if loss of power or excess valve lifter noise is apparent.
	12	Remove the valve covers, and adjust the valve lifter clearances if necessary. The correct clearances are 0.006 inches hot for intake, and 0.008 inches hot for exhaust valve lifters.
	13	<u>Compression test.</u> Remove the spark plugs and insert a compression gage into the spark plug hole. Crank the engine with the starting crank several times until the gage reading stabilizes. Test the other cylinders and record the readings on DA Form 464. If the gage readings for any cylinders are below 70 psi (pounds per square inch), add one fluid ounce of crankcase oil to the cylinders with the deficient readings and retest.
	13	If the compression was not restored by adding the oil, check the cylinder head bolts for tightness. Tighten any loose bolts and re-test. If low compression persists, the trouble lies with the cylinder head gasket, valves, or piston rings. Replace a faulty head gasket and adjust valve lifters if necessary. Report worn valves or piston rings to the proper authority.
14	14	<u>Crankcase, breathers.</u> With the engine idling, examine the crankcase, valve covers, timing gear cover, and oil pan for leaks, damage, or dents. Check the oil filler or crankcase breather caps for cleanness.

Inspection	Service Quarterly	
	14	Clean a dirty oil filler cap or crankcase breather. Add or change oil as necessary, according to the current Lubrication Order. Correct or report to the proper authority any oil leaks.
15	15	<u>Oil Filter.</u> With the engine idling, check the oil filter for any leaks. Also check the lines leading to the oil filter for kinks, leaks, or other damage. Check the oil filter body for cracks.
	15	Replace a damaged oil filter (par. 81), or any damaged lines (par. 83). Correct any deficiencies noticed. Service the oil filter according to the current Lubrication Order. After servicing, check carefully for leaks while the engine is running. Note whether leaks occur at the cover gasket, and replace if necessary (par. 81c).
16	16	<u>Radiator.</u> Inspect the radiator assembly for leaks, obstructions in the core air passages, and loose mounting bolts. Check all cooling system hoses for leaks, deterioration, and loose connections. Check the engine coolant for rust, oil, or other foreign matter. If anti-freeze is used, check the freezing point of the coolant (Table 11).
	16	Drain, Flush, and refill the cooling system if the coolant is contaminated with rust or dirt. See that the core air passages are clean. Renew damaged or defective cooling system hose, lines, or gaskets (par. 78). See that all mounting bolts and connections are tight. Protect the coolant from freezing, and record its freezing point on DA Form 464.
17	17	<u>Water pump, fan and shroud.</u> Inspect the water pump to see that it is in good condition, not leaking, and securely installed. Examine the shaft for end play and loose bearings. Inspect the fan blades to see if they are in good condition, and properly secured. Check the fan assembly mounting.
	17	Tighten or replace loose or missing mounting nuts and screws. Replace missing or damaged lubrication fittings, defective or damaged water pump (par. 76), or the fan assembly (par. 75). Correct any other deficiencies noticed.
18	18	<u>Belts and pulleys.</u> Inspect the fan V-belt for fraying, wear, and deterioration. Check V-belt tension and condition, and alignment of pulleys. Check the V-belt tension midway between the drive pulley and the fan assembly. Proper tension is indicated when the fan belt will deflect $\frac{1}{2}$ to 1 inch.
	18	Adjust the fan V-belt tension (par. 66e). Replace a frayed or worn V-belt (par. 74). Check the pulleys for good condition and correct or report deficiencies to the proper authority.
19	19	<u>Oil pump and pressure relief valve.</u> Check the oil pressure when the engine is running at normal operating temperature; record the oil pressure on DA Form 464. Normal oil pressure is 10-15 psi at operating speed (1600 RPM) and 5-10 psi at idling speed (400 RPM).
	19	If the oil pressure is not normal, correct it by changing the oil pressure regulator setting (par. 85d). Report any other deficiencies to the proper authority.
20	20	<u>Governor and linkage.</u> Inspect the connecting linkage between the governor and carburetor for binding. Check the adjustment of the governor as follows: Operate the engine at maximum speed without load. If the engine surges, the governor is out of adjustment.
	20	Adjust the governor and linkage if necessary (par. 85d). Correct any other deficiencies or report them to the proper authority.
<b>FUEL SYSTEM</b>		
39	39	<u>Carburetor and linkage.</u> Inspect the carburetor to see that it is in good condition, correctly assembled, and securely mounted. Check for leaks. Inspect the choke and governor-to-carburetor linkages for binding and insecure mounting.
	39	Tighten all loose mounting and assembly nuts, and screws. Replace a damaged or defective carburetor and worn or damaged linkages (par. 59a).
40	40	<u>Filter.</u> Check the fuel strainer for leaks, insecure mounting, or damaged parts. Inspect the sediment bowl of the fuel strainer for the presence of dirt or water.
	40	Remove the sediment bowl and screen, and clean out all dirt or water. Replace the gasket if necessary (par. 57a). Correct any other deficiencies noticed.
41	41	<u>Air Cleaner.</u> Remove the air cleaner oil cup, and check the air cleaner for dents or other damage. Check the condition of the air cleaner oil cup mounting clamp, and hose connections to see that they are secure. Check the condition and quantity of oil in the oil cup. Inspect the filtering element.
	41	Clean and service the air cleaner (par. 56b). Replace any damaged or unserviceable parts, especially filtering elements which cannot be properly cleaned. Reassemble the air cleaner and check for proper mounting. Be sure the air cleaner and carburetor connections are tight.

Inspection	Service Quarterly	
43	43	<u>Fuel tank and cap.</u> Inspect the fuel tank to see that it is securely mounted and in good condition. Inspect the cap for a defective gasket or plugged vent hole. See that the filler neck is in good condition and that the cap fits securely.
	43	Secure all loose tank mountings. Replace a leaking or damaged fuel tank (par. 61a). Open a plugged filler cap vent hole. Replace a defective or damaged cap.
44	44	<u>Fuel lines.</u> Check the fuel lines for kinks, breaks, and loose connections at the fuel tank, fuel strainer, and carburetor.
	44	Repair or replace damaged or collapsed fuel lines (par. 61a). Tighten all loose connections.
46	46	<u>Spark plugs.</u> Inspect the spark plugs for loose or bad connections, and dirty or broken insulators. If the engine lacks power, check the condition of the spark plug electrodes and check the spark plug gap.
	46	Replace damaged or defective spark plugs (par. 65a). Tighten loose spark plugs and connections.
	46	Remove spark plugs and clean carbon deposits from the electrodes. Set the spark gap on each plug. The proper gap is 0.025 inch. Reinstall the plugs, using new gaskets (par. 65d).
49	49	<u>Magneto.</u> Inspect the magneto for loose mounting screws and wiring connections. Correct any deficiencies noted.
49	49	Remove the end cover and inspect the ignition cap for cracks and corroded terminals. Inspect the air vents for clogging. Examine the breaker points to see that they are properly aligned, that the mating surfaces engage squarely, and are not pitted or burned (par. 69). Check the breaker point gap. The correct gap is 0.014 to 0.018 inch at full separation of the points.
	49	Clean the rotor and distributor compartment. If necessary, resurface or replace the breaker points. Adjust the breaker point gap (par. 69e). Clean clogged air vents, and replace a broken or cracked distributor cap.
50	50	<u>Wiring and switches.</u> Check the ignition switch wire for oil-soaked, frayed, or broken insulation, broken strands, and loose or corroded connections. Check the ignition switch for proper operation.
	50	Replace defective wires (par. 69d). Clean dirty wires and corroded connections. Tighten all loose connections and switch mounting hardware. Replace a defective ignition switch.

#### CONTROL SYSTEM

62	62	<u>Levers and linkage.</u> Check the engine clutch lever, water valve lever, skip clutch lever, skip brake lever, discharge handwheel, and water volume control for loose connections, loose or missing bolts, nuts, and pins.
	62	Tighten or replace loose or missing bolts, nuts, or pins. Correct any other deficiencies or report them to the proper authority.
67	67	<u>Power control unit.</u> Inspect the loader skip clutch and brake operation. Clutch should completely disengage before the skip comes within 4 to 6 inches of striking the upper shaft. The brake should then hold the skip in its raised position until released.
	67	Adjust the clutch (par. 99), clutch knockout arm (par. 101), or brake (par. 102) if necessary. Correct any other deficiencies or report them to the proper authority.
68	68	<u>Drums, sheaves, and cables.</u> Inspect the loader skip cable, spools, and pulley for improper mounting and excessive wear. Check cables for flat spots, fraying, kinks, broken strands, or excessive wear.
	68	Replace unserviceable cables. Tighten loose mounting hardware. Report other deficiencies noticed to the proper authority.
69	69	<u>Tie rods.</u> Check the tie rod ends for excessive wear and adjustment. Check to see that the steering knuckles are properly lubricated and in serviceable condition.
	69	Adjust the steering assembly if necessary (par. 152). Tow-in should be one-quarter inch. Correct any deficiencies noticed or report them to the proper authority.

#### FRAMES AND MOUNTINGS

76	76	<u>Tires.</u> Inspect the tires for proper air pressure, excessive wear, cuts, embedded foreign matter, and missing valve caps. Correct air pressure is 40 psi for front and rear tires.
	76	Remove all foreign matter. Inflate all tires to correct pressure, and replace missing valve caps. Replace worn or damaged tires (par. 153).
77	77	<u>Tow-hitch.</u> Inspect the towing tongue for secure mounting, paying particular attention to the clevis pin and cotter key.

Inspection	Service Quarterly	
	77	Replace a worn clevis pin or cotter key (par. 151). Correct any other deficiencies noticed or report them to the proper authority.
78	78	<u>Rear wheels.</u> Check for loose or missing studs, nuts, discs, or hub assembly cap screws. Check for leaking oil or grease seals. Check bearing assemblies for proper adjustment.
79	78	Tighten loose and replace missing studs, nuts, discs or cap screws, and defective seals.
	79	<u>Front wheels.</u> Check for loose or missing studs, nuts, discs, or hub assembly cap screws. Check for leaking oil or grease seals. Check bearing assemblies for proper adjustment.
80	79	Tighten loose and replace missing studs, nuts, lugs, cap screws, and defective seals.
	80	<u>Frame.</u> Check the mixer frame for bent members, loose or missing bolts, and cracks and breaks.
	80	Tighten or replace loose, worn, or missing bolts and pins. Report any other deficiencies noticed to the proper authority.
81	81	<u>Front axle assembly.</u> Check for loose or missing bolts, nuts, cap screws, and lockwashers. Check the mounting of the front axle, and check for a damaged axle.
	81	Tighten or replace loose, worn, or missing bolts, nuts, cap screws, and lockwashers. Report any other deficiencies noticed to the proper authority.
82	82	<u>Rear axle assembly.</u> Check for loose rear axle mounting bolts, nuts, and lock pins, or damaged axle.
	82	Tighten or replace loose, worn, or missing bolts, nuts, cap screws, and lockwashers. Report any other deficiencies noticed to the proper authority.
DRIVE SYSTEM		
93	93	<u>Transfer case.</u> Check the power transfer case for loose or missing mounting bolts, nuts, or cap screws. Inspect for oil leaks, and check the lubricant level in the case. Check unusual gear noises.
	93	Tighten or replace loose or missing bolts, nuts, and cap screws. Correct oil leaks, or report them and other deficiencies noticed to the proper authority.
94	94	<u>Drive sprockets and chains.</u> Inspect the drive chain guard and cover for cracks or dents. Check for loose or missing mounting cap screws or lockwashers. Check for proper lubrication.
	94	Tighten or replace loose or missing mounting cap screws and lockwashers. Report any other deficiencies noticed to the proper authority.
95	95	<u>Master clutch.</u> Inspect the operation and adjustment of the clutch assembly. It should hold securely when engaged, and not drag when released. Remove the inspection plate, and check for loose clutch mounting hardware.
	95	Adjust clutch if necessary (par. 99). Report any other deficiencies noticed to the proper authority.
104	104	<u>Gear and pinion.</u> Inspect the drum gear segments and drive spur gear for loose or missing mountings, cap screws and nuts, and check for chipped or worn teeth.
	104	Tighten or replace any loose or missing mounting cap screws and nuts. Report chipped or worn gear teeth, and other deficiencies noticed to the proper authority.
105	105	<u>Bearing and shaft.</u> Check the main drive shaft bearings for loose or missing mounting bolts, nuts, and lockwashers; proper lubrication, and correct alignment with the main drive shaft. Check the shaft for bends, twists, or improper alignment.
	105	Tighten or replace loose or missing mounting bolts, nuts, and lockwashers. Report other deficiencies noticed to the proper authority.
MIXERS		
178	178	<u>Drum.</u> Inspect the drum buckets and blades for damage and improper mounting. Check the drum interior for excessive accumulations of hardened concrete or aggregate.
	178	Correct or tighten any improper or insecure drum bucket or blade mountings. Remove excessive accumulations of hardened concrete or aggregate from the drum interior. Report other deficiencies noticed to the proper authority.
179	179	<u>Rollers and bearings.</u> Inspect roller tracks and rollers for wear, flat spots, and improper alignment. Check the bearings for proper collar adjustment and lubrication.
	179	Remove grease and dirt from the roller tracks and the rollers, and make sure the rollers turn freely. Free-up or adjust roller bearings by loosening the set screw in the adjusting collar, and loosening or tightening the bearing as necessary for free turning rollers. Report deficiencies not corrected to the proper authority.
180	180	<u>Skip.</u> Inspect the skip for cracks, breaks, or broken parts, paying particular attention to cable guides. Check the skip bumper for proper adjustment or lubrication.

Inspection	Service Quarterly	
	180	Tighten or replace any loose or missing mounting bolts, cap screws, nuts, lockwashers, or cable guides. Report other deficiencies noticed to the proper authority.
181	181	<u>Water tank.</u> Check the water tank for leaks, breaks, or missing parts. Check valves for sticking or defective operation. Check for a clogged or damaged water gage.
	181	Repair any leaks to the water tank. Clean sticking valves and a clogged or damaged water gage. Report other deficiencies noticed to the proper authority.
181	181	Auxiliary water pump. Inspect the auxiliary water pump assembly to see that it is in good condition, not leaking, and securely mounted. Examine the shaft for end play and loose bearings. Check the auxiliary water pump V-belts for fraying, wear, and deterioration. Check the condition and alignment of pulleys.
	181	Tighten or replace loose or missing mounting nuts and screws. Replace a defective or damaged auxiliary water pump assembly (par. 112c). Replace a frayed or worn V-belt. Report any deficiencies noticed to the proper authority.

### Section III. TROUBLESHOOTING

#### 33. GENERAL

This section provides troubleshooting information useful to the operator in diagnosing, correcting, and/or reporting unsatisfactory operation or failure of the concrete mixer or any of its components. Prior to performing troubleshooting operations to discover reasons for malfunction of the unit, be certain that all starting and operating procedures (pars. 16 and 18) have been

followed. The probable causes listed are those which can be observed by the operator as the cause of the trouble; the possible remedies described are those which are to be performed by the various echelons as determined by the Maintenance Allocation Chart in Appendix II. Troubles and unsatisfactory operation which cannot be corrected by the operator must be reported immediately to the proper authority for correction by a higher echelon level of maintenance.

#### 34. ENGINE FAILS TO START OR IS HARD TO START

<u>Probable cause</u>	<u>Possible remedy</u>
Battery defective or connections loose or dirty . . . . .	Recharge battery or replace. Clean and tighten connections.
Defective starting motor . . . . .	Replace starting motor.
Fuel supply empty or shut off . . . . .	Clean fuel lines.
Fuel filter clogged . . . . .	Clean fuel filter.
Overchoking . . . . .	Crank engine with choke and throttle wide open.
Carburetor out of adjustment . . . . .	Adjust carburetor.
Dirty or damaged spark plugs . . . . .	Replace or clean and adjust plugs.
Faulty fuel pump . . . . .	Replace pump.
Defective magneto . . . . .	Examine points, clean, and adjust, or replace magneto if necessary.
Defective ignition wires . . . . .	Check for cracks and chafed or oil-soaked wires; replace defective wires.
Poor compression . . . . .	Adjust valve tappets. Check for broken valve springs.
Valves burnt, warped, sticking, or not seating properly . . . . .	Repair or replace valves.
Improper ignition timing . . . . .	Set timing.

### 35. ENGINE MISSES OR RUNS ERRATICALLY

<u>Probable cause</u>	<u>Possible remedy</u>
Air in fuel line . . . . .	Prime fuel system.
Water in fuel . . . . .	Drain fuel system and refill
Faulty governor. . . . .	Replace or adjust governor.
Dirty or damaged spark plugs . . . . .	Remove, clean, inspect, adjust, and re-install.
Ignition cable connection loose or shorted . . . . .	Tighten all connections and check for worn insulation; replace damaged wires.
Magneto breaker points burnt, pitted, or out of adjustment . . . . .	Clean or adjust points or replace if badly burned or pitted.
Valves burnt, warped, sticking or not seating properly . . . . .	Repair or replace valves.
Valve tappets incorrectly adjusted. . .	Adjust valve tappets.
Valve spring broken . . . . .	Replace broken valve spring.
Air leak between carburetor, manifold and engine combustion chamber . . . . .	Check for leaks in gaskets, or for cracks in the manifold; tighten or replace faulty gaskets or manifold.
Blown head gasket. . . . .	Replace gasket.

### 36. ENGINE KNOCKS OR DEVELOPS EXCESSIVE NOISE

<u>Probable cause</u>	<u>Possible remedy</u>
Improper governor adjustment . . . . .	Adjust governor.
Poor carburetion . . . . .	Adjust carburetor.
Air cleaner clogged . . . . .	Service air cleaner.
Poor spark . . . . .	Clean, adjust, or replace breaker points.
Improper ignition timing . . . . .	Set Timing.
Valves sticking or need adjustment . .	Grind valves or adjust.
Low compression . . . . .	See "Engine Misses or Operates Erratically" above, or replace piston and rings.

### 37. ENGINE STOPS SUDDENLY

<u>Probable cause</u>	<u>Possible remedy</u>
Coolant level low . . . . .	Fill radiator with proper coolant.
Fan belt defective or slipping . . . . .	Adjust tension or replace fan belt.
Radiator or coolant lines obstructed . .	Inspect and flush radiator or clean coolant lines.
Improper lubrication. . . . .	See causes of low oil pressure.
Defective thermostat . . . . .	Replace thermostat.
Water pump defective. . . . .	Replace water pump.

### 38. ENGINE OVERHEATS

<u>Probable cause</u>	<u>Possible remedy</u>
Oil too light or badly diluted . . . . .	Drain crankcase and refill with proper grade of oil. See causes for engine overheating.
Oil level too low . . . . .	Add oil.
Oil pressure relief valve not seating .	Remove, clean, or replace valve.
Oil filter or lines clogged . . . . .	Clean filter and lines.
Defective oil pressure gage . . . . .	Replace gage.
Defective oil pump . . . . .	Replace oil pump.
Badly worn bearings . . . . .	Replace bearings.

### 39. ENGINE OIL PRESSURE LOW

<u>Probable cause</u>	<u>Possible remedy</u>
Low oil supply . . . . .	Add oil (See Figure 9).
Advanced spark . . . . .	Reset timing.
Spark plugs burned or dirty . . . . .	Clean or install new plugs.
Low grade oil or octane fuel . . . . .	Use correct grade fuel and oil
Overheated engine . . . . .	Allow engine to cool, then determine the cause of overheating.

### 40. ENGINE EXHAUST SMOKE EXCESSIVE

<u>Probable cause</u>	<u>Possible remedy</u>
Empty fuel tank . . . . .	Refill tank.
Fuel pump failure . . . . .	Replace fuel pump.
Engine overheated . . . . .	See causes of engine overheating.
Low oil pressure . . . . .	See causes of low oil pressure.
Defective magneto . . . . .	Replace magneto.

### 41. GENERATOR NOT OPERATING PROPERLY

<u>Probable cause</u>	<u>Possible remedy</u>
Fan belt slipping or broken . . . . .	Replace or adjust fan belt.
Brushes worn . . . . .	Replace brushes.
Voltage regulator defective or needs adjustment . . . . .	Replace regulator.
Ammeter defective . . . . .	Replace ammeter.
Wiring loose or broken . . . . .	Inspect and repair wiring.
Generator defective . . . . .	Replace generator.

#### 42. ENGINE CLUTCH SLIP, WILL NOT ENGAGE, OR CHATTERS

<u>Probable cause</u>	<u>Possible remedy</u>
Engine clutch out of adjustment or defective. . . . .	See paragraph 99.

#### 43. SKIP NOT FUNCTIONING PROPERLY

<u>Probable cause</u>	<u>Possible remedy</u>
Skip clutch, clutch knockout arm, brake, or bumper out of adjustment or defective. . . . .	See paragraph 97.
Skip hoist cables twisted on spools or pulley . . . . .	Remove and rewind.

#### 44. MIXING DRUM NOT FUNCTIONING PROPERLY

<u>Probable cause</u>	<u>Possible remedy</u>
Mixing drum overloaded . . . . .	Reduce amount of batch mixed.
Mixer not level. . . . .	Level mixer.
Mixing drum will not rotate, rotate smoothly or rotate at proper speed . . .	Report to proper authority.

#### 45. MIXER WATER SYSTEM NOT FUNCTIONING PROPERLY

<u>Probable cause</u>	<u>Possible remedy</u>
Water not reaching concrete mixer . .	Check water supply line to mixer for breaks or loose connections. Correct deficiencies or report them to proper authority.
Water not reaching water tank . . . . .	Check auxiliary water pump or check for pump malfunction.

#### 46. AUXILIARY WATER PUMP NOT FUNCTIONING PROPERLY

<u>Probable cause</u>	<u>Possible remedy</u>
Pump will not hold prime due to loose drain plug . . . . .	Tighten drain plug.
Pump V-belts slipping. . . . .	Adjust pump V-belts (par. 112b).
Water supply low. . . . .	Check and replenish water supply.
Pump seal leaking . . . . .	Report to proper authority.

#### 47. SKIP CLUTCH DOES NOT DISENGAGE WHEN SKIP IS RAISED, OR IN PROPER DISCHARGE POSITION

<u>Probable cause</u>	<u>Possible remedy</u>
Skip clutch knockout arm out of adjustment . . . . .	Adjust skip clutch knockout arm (par. 101).

#### 48. BATCH DOES NOT DISCHARGE PROPERLY FROM MIXING DRUM

<u>Probable cause</u>	<u>Possible remedy</u>
Drum rotating too fast causing batch to carry over in drum . . . . .	Adjust engine governor (par. 60c).
Drum rotating too slow, and not carrying batch high enough in drum. . . . .	Adjust engine governor (par. 60c).



## Section IV. RADIO INTERFERENCE SUPPRESSION

### 49. DEFINITIONS.

a. Interference. The term "interference" as used herein, applies to electrical disturbances in the radio frequency range which are generated by the concrete mixer and which may interfere with the proper operation of radio receivers or other electronic equipment.

b. Interference Suppression. The term "interference suppression" as used herein, applies to the methods used to eliminate or effectively reduce radio interference generated by the concrete mixer.

### 50. PURPOSE OF INTERFERENCE SUPPRESSION

The tactical importance of effective interference suppression cannot be stressed too greatly. Since the electrical disturbances generated by the concrete mixer are composed partly of electrical waves in the radio frequency range, they must be suppressed for two important reasons. First, they will interfere with the proper operation of the friendly radio set, and second, they will enable the enemy to locate the equipment and its associated units.

### 51. GENERAL SOURCES OF INTERFERENCE

Generally, radio interference is generated anywhere a spark occurs or where a high-frequency current is present. A spark is a small amount of current jumping an air gap in response to the force of a relatively high voltage. The gasoline engine ignition system is a common source. Magneto breaker points, generator commutators, tacts, and static charges collecting on the frame are other common sources which in some way must be suppressed.

### 52. GENERAL METHODS USED TO ATTAIN PROPER SUPPRESSION

Essentially, suppression is attained by providing a low resistance path to ground for the stray currents. The methods used to attain suppression include shielding the ignition and high-frequency wires, grounding the frame with banding straps, and using capacitors, and resistors where necessary.

a. Effects of Suppression. There is no interference from equipment satisfactorily suppressed for radiated and conducted interference over the frequency range of 0.35 through 100.00 megacycles at a distance of 5 feet from the unit.

#### b. Testing Suppression

(1) Install a radio receiver in good operating condition not more than 5 feet from the generator set. A wide band receiver covering the frequency range of 0.35 to 100.00 megacycles is preferred.

(2) Start equipment and tune receiver. Turn receiver volume control to maximum, and select three widely separated frequencies for listening. Use frequencies that are free from signals with strong carriers so that the receiver will be in its most sensitive operation condition.

(3) Operate engine throttle, and listen to receiver speaker or headset. A regular clicking sound, which varies with engine speed and ceases the instant the ignition is shut off, indicated faulty radio suppression.

(4) Systematically replace suppression components in the circuit causing trouble, testing after the replacement of each component to see if the trouble has been eliminated.

### 53. INTERFERENCE SUPPRESSION COMPONENTS

a. Generator. The generator (3, Fig. 4) is mounted on the forward or fan end on the back-side or mixer drum side of the engine. It is equipped with a shielded cable, suppression receptacle, and tooth-type lock washers to suppress radio interference. If there is excessive sparking at the brushes, it will be necessary to clean the commutator and to install new brushes. Report this condition to field maintenance.

b. Magneto. The magneto (69, Fig. 3) is located on the right-hand front side of the engine. It is a self-suppressed unit with a fixed capacitor located just below the end cover, to suppress interference.

### 54. REPLACEMENT OF INTERFERENCE SUPPRESSION COMPONENTS

a. General Replacement of suppression components must be identical in part number to the original parts that they replace. The capacitors must be the same size and have the same microfarad and voltage ratings as the parts being replaced. Special care must be taken to ensure good metal-to-metal contact between washers and bonding straps.

b. Spark Plug Cables. Refer to paragraph 65 for proper replacement of the shielded spark plug cables.

c. Magneto. Refer to paragraph 69c for proper replacement of the magneto capacitor and bonding strap.

d. Generator. Refer to paragraph 66a for proper replacement of the generator shielded cable. Refer to paragraph 66c for proper installation of generator brushes.

e. Assurance of Good Suppression. It is good practice to daily inspect all external and internal-tooth lock washers used on suppression components. Be sure that lock washer teeth dig into the metal surfaces they contact, tighten cap screws and nuts securely, and replace any missing washers or washers which have flattened teeth.

## Section V. FUEL SYSTEM

### 55. DESCRIPTION

The engine fuel system (Fig. 13) consists of a gasoline fuel tank, fuel strainer, shutoff cocks, carburetor, governor, air cleaner, and the necessary flexible tubing and connectors. Fuel flows by gravity from the fuel tank to the fuel strainer, and then into the carburetor. Fuel flow is controlled at the strainer by an integral shutoff cock; a removable transparent bowl and strainer screen collects dirt solids and water, allowing only clean fuel to enter the system. In a similar manner, the air cleaner removes dust, water and grit from the air as it passes through the air cleaner and on to the carburetor where it is then mixed in controlled amounts with fuel in the carburetor for proper ignition and combustion by the spark plugs in the engine.

### 56. AIR CLEANER

#### a. Removal and Disassembly (Fig. 10).

(1) Loosen the four tube clamps (11), loosen nuts (1) and screws (2), and remove the air cleaner as an assembly from the engine.

(2) Disassembly of the air cleaner is complete upon lifting off the air stack cap (4), disengaging clamp (5), and withdrawing the oil cup (6) and inner cup (7) from the body assembly (12).

#### b. Cleaning, Inspection and Repair.

(1) Clean all parts of the air cleaner in an approved cleaning solvent; blow dry with compressed air.

(2) Repair minor dents in the oil cup, bands, or clamp using a plastic mallet.

(3) Inspect the air cleaner tubes; replace them if they are no longer serviceable.

c. Reassembly and Installation. Reassembly and installation is essentially the reverse procedure of disassembly and removal. Be sure to add the specified amount and type of oil to the inner oil cup (7) as outlined in the Lubrication Order (Fig. 9).

### 57. FUEL STRAINER

a. Removal and Disassembly (Fig. 11). Close shut-off valve (7), disconnect the fuel line fitting at the strainer assembly, and remove strainer (23, Fig. 3). Loosen the thumb nut (3, Fig. 11) swing the wire and nut assembly (1) to one side, and separate the bowl (4) and gasket (5) from the cover (8) and screen (6).

b. Cleaning and Repair. It is good practice to visually inspect the fuel strainer daily for signs of dirt or water in

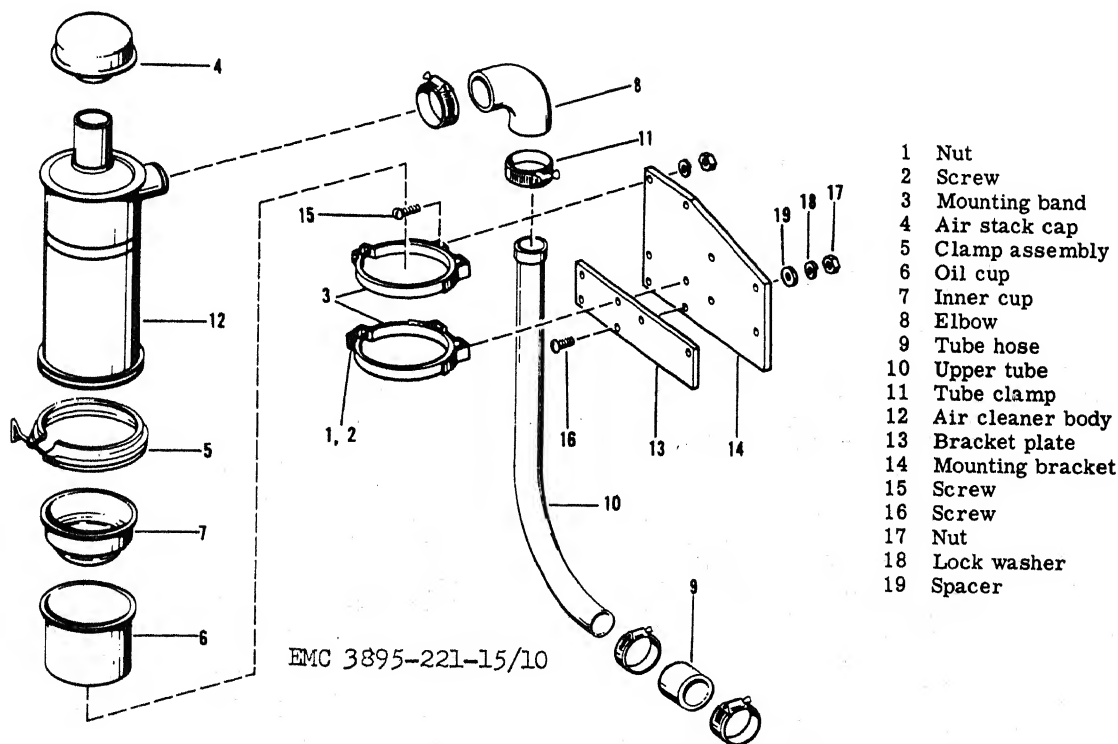
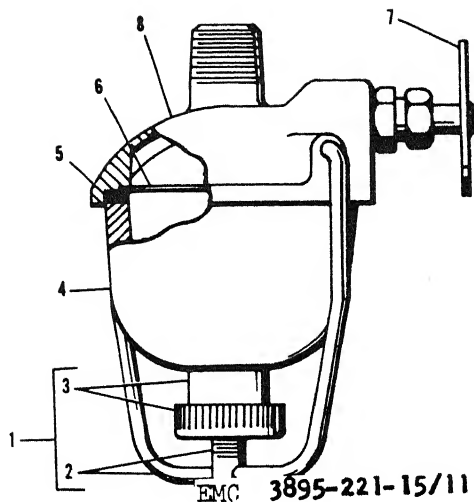


Figure 10. AIR CLEANER ASSEMBLY



- 1 Wire and nut assembly
- 2 Wire clamp
- 3 Thumb nut
- 4 Strainer bowl
- 5 Gasket
- 6 Screen
- 7 Shut-off valve
- 8 Cover

Figure 11. FUEL STRAINER ASSEMBLY.

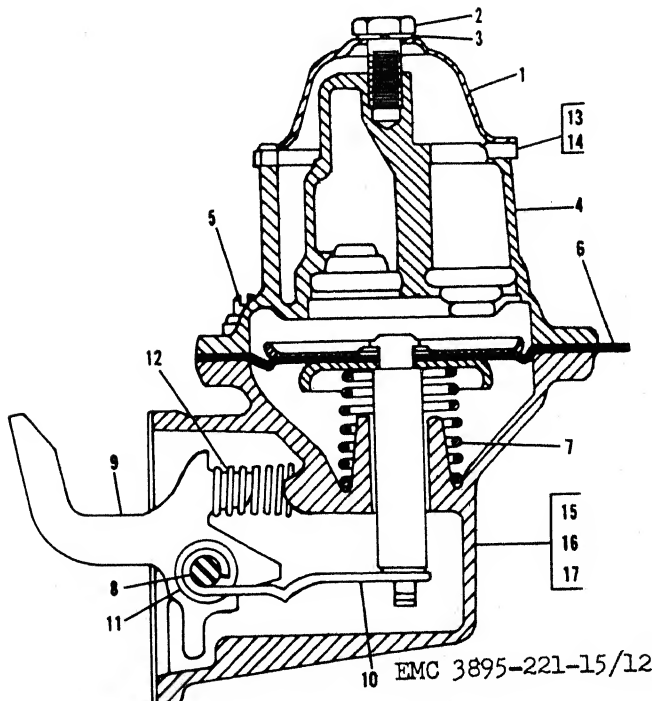
the strainer glass bowl, which will usually indicate that the screen is becoming clogged with accumulated dirt. Disassemble the components as in step a., and wash the parts clean in an approved cleaning solvent. Dry thoroughly and inspect the bowl and gasket for cracks and distortion, inspect the screen for holes in the screen mesh; discard parts having these signs and replace them with new parts having the same part numbers. Threads of the shut-off valve should be in good condition, allowing unbinding movement of the handle.

c. Reassembly and Installation (Fig. 11). Reassemble and install the fuel strainer (23, Fig. 3) in essentially the reverse order as described in step a. Be sure fuel line connections are securely made and that the fuel is allowed to flow freely and without sharp bends or obstructions. Open fuel shut-off valve (7), start the engine and check for leakage at the connections.

## 58. FUEL PUMP

a. Removal and disassembly (Fig. 12). Close the shut-off valve (24, Fig. 3), disconnect fuel lines from the fuel pump (83, Fig. 3), remove the attaching parts, and withdraw the fuel pump from the engine. Remove screws (2, 5, Fig. 12), and separate the cover and valve (4) from the body (17); lift out the diaphragm and pull rod (6). Tap out the rocker arm pin (8), and remove the rocker arm (9), spring (12), and link (10).

b. Cleaning and Repair. Wash all parts in an approved cleaning solvent, and blow dry with compressed air. Discard broken or distorted parts; replace them with new parts having the same part numbers.



- 1 Cover plate
- 2 Cap screw
- 3 Screw gasket
- 4 Cover and valve
- 5 Cover screw
- 6 Diaphragm and pull rod
- 7 Diaphragm spring
- 8 Rocker arm pin
- 9 Rocker arm
- 10 Link
- 11 Arm pin washer
- 12 Arm spring
- 13 Screen
- 14 Plate gasket
- 15 Drain plug screw
- 16 Drain screw gasket
- 17 Body

Figure 12. FUEL PUMP ASSEMBLY

c. Reassembly and Installation (Fig. 12). Reassemble and install the fuel pump assembly in the reverse order of the index number sequence of Figure 12 and Step a, being careful not to distort the diaphragm when securing the cover plate (1) to the body (17). Open shutoff valve (24, Fig. 3).

## 59. CARBURETOR

### a. Removal (Fig. 3).

(1) Remove the air cleaner (27) to carburetor (77) outlet tube.

(2) Disconnect the fuel pump to carburetor fuel line.

(3) Detach choke wire from the carburetor choke lever.

(4) Detach governor control rod (37) from the throttle lever by removing nut and lock washer from the ball joint assembly.

(5) Remove the two nuts (80) lock washers (81) and lower the carburetor (77) and gasket (78).

### b. Cleaning and Inspection.

(1) Use a clean cloth moistened with cleaning solvent to wipe any dirt and grease from the carburetor body. Use a stiff brush to clean threaded areas of screws and body.

(2) Visually inspect carburetor body for cracks or breaks. If any are noticed, report them to the proper authority.

(3) Inspect for stripped or burred threads. Replace defective screws.

(4) Check throttle and choke lever for freedom of motion. Visually inspect butterfly through opening in carburetor air intake.

### c. Installation (Fig. 3).

(1) Place gasket (78) in position on the mounting studs in the top of the carburetor body and insert the studs in the holes in the manifold flange and secure with two lock washers (81) and nuts (80). Draw up evenly and tighten securely.

(2) Secure the governor control rod (37) to the throttle lever by installing nut and lock washer on the ball joint assembly.

(3) Install fuel line.

(4) Attach choke wire to the carburetor choke lever.

(5) Install the air cleaner hose.

### d. Adjustment (Fig. 3).

(1) General. Allow the engine to reach normal operating temperature of 160° F. before attempting any carburetor adjustment.

(2) The idle speed adjustment screw (43, Fig. 40) is located to the left and in back of the throttle lever, to which the governor control rod (37, Fig. 3) is attached. The idle mixture needle (5, Fig. 40) is located to the right of this lever and is next to the fuel inlet hose connection.

(3) Idle Speed Adjustment. Turn idle speed adjustment screw clockwise to increase engine idling speed and counterclockwise to decrease engine idling speed.

(4) Idle Mixture Adjustment. Follow procedure in step (3) to increase the engine slightly faster than idling speed. Turn idle mixture screw clockwise until the engine begins to stall, then back the idle mixture screw off a half turn. Reset engine idling speed as provided in step (3).

## 60. GOVERNOR

a. Linkage Removal (Fig. 3). Detach the governor control rod (37) from the governor control arm by removing the nut and washer from the ball joint (38) assembly.

b. Linkage Installation (Fig. 3). Secure the governor control rod (37) to the governor control arm at the ball joint (38) assembly with washer (40) and nut (39).

### c. Adjustment (Fig. 3).

(1) Start the engine and allow it to reach normal

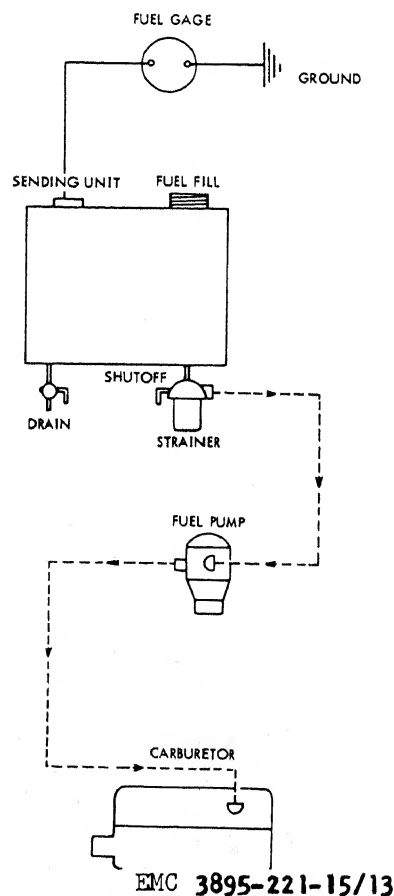


Figure 13. FUEL SYSTEM SCHEMATIC DIAGRAM.

operating temperature. Open engine to full throttle and allow it to run at its maximum governed speed of 1,800 rpm.

(2) Turn speed adjusting screw (93) clockwise to decrease the engine speed and counterclockwise to increase the engine speed; then tighten locknut.

(3) If the engine tends to hunt (alternately increase and decrease speed) under load, disengage load and adjust the bumper screw. Loosen the locknut and turn the bumper screw clockwise until the speed fluctuation stops; then tighten locknut. This operation sometimes increases engine speed. See above to reset engine to maximum governed speed to 1,800 rpm.

#### 61. FUEL TANK, LINES, VALVES, AND FITTINGS

a. Removal and Installation (Fig. 3). Drain the fuel tank (1) at drain cock (13), remove the fuel strainer (23) from below the fuel tank, remove the attaching parts that secure the fuel tank hold-down straps (2), and lift the fuel

tank from its supports (6 and 7). Figure 13 illustrates a schematic diagram of the fuel system lines and components. Remove these components by disconnecting the various tube fittings. Install the fuel tank, lines, and system components by reversing the removal procedures.

##### b. Cleaning, Inspection, and Repair.

(1) Clean all parts with an approved dry cleaning solvent.

(2) Inspect fuel tank for dents, cracks, or signs of leakage; inspect fuel tank cap for damaged threads or other signs of unservicability. Discard these parts and replace them with new parts having the same part numbers, if found defective.

(3) Inspect fuel lines for sharp bends which would restrict fuel flow, tube connectors for damaged threads, and all mounting hardware and supports for signs of damage. Discard these damaged parts and replace as required.

### Section VI. ENGINE ELECTRICAL SYSTEM

#### 62. DESCRIPTION

a. General. The 24-volt electrical system of the concrete mixer, consists of two 12-volt batteries, belt driven generator, starter motor, magneto, generator regulator, panel lights and switches, and the necessary wiring to interconnect these components and make them operative. The wires are shielded for purposes of radio interference suppression. The two batteries are connected in series and are the reservoir of electrical energy required to actuate the engine starter motor. The starter motor is a 24-volt series wound electric motor which is used, as the name implies, to start or crank the engine. The batteries are maintained in a charged condition by a V-belt driven 24-volt generator. The generator charging rate is automatically controlled by the engine generator voltage regulator. The magneto furnishes the high-tension current through the spark plug leads to the spark plugs. This high-tension spark from the plugs explodes the fuel vapors in the combustion chambers of the engine.

b. Electrical Circuits. The circuits which make up the electrical system are illustrated in the wiring diagram of Figure 6. Their functions are as follows:

(1) Starting. The starting circuit conducts the electric power by which the engine is cranked, and includes the ignition switch (19), starter switch (30), starting motor (33) batteries, and all interconnecting cables and wiring. The 24-volt starting motor receiver control knob, through suitable linkage, closes the switch on the starting motor and at the same time operates a shift lever which engages an overrunning clutch which meshes the drive pinion with the flywheel ring gear during starting.

(2) Charging. The charging circuit consists of the engine generator (38) and its leads. The generator is a device for changing mechanical energy into electrical impulse. The batteries, which are only a storage reservoir of electrical energy, are constantly being supplied and maintained with electrical energy generated or created by the generator. For example: as soon as the engine starts, the generator begins to replace the electrical

energy used by the batteries in the process of actuating the starter motor.

(3) Ignition. The radio suppressed ignition circuit consists of a magneto (23) mounted horizontally on the right side of the engine block, four shielded spark plugs, and four spark plug cables provided with flexible metal shielding. The magneto is equipped with an impulse coupling which makes possible a powerful spark for easier starting. The impulse coupling automatically retards the timing of the spark for starting, thus eliminating danger of kickback. A distributor is built into the magneto to deliver the spark to the proper cylinder at the proper instant.

(4) Lighting. The lighting circuit consists of two hooded panel lights (10), the lighting circuit ON-OFF switch (5), and the wires connecting the lights into the electrical source. The lights aid in reading the panel-mounted gauges and instruments under adverse lighting conditions.

#### 63. BATTERIES AND CABLES

a. Removal and Installation. Remove and install the batteries and cables as shown in Figure 14. When securing the batteries in the box, be careful not to distort the batteries by excessive tightening of nuts (5).

##### b. Service and Testing.

(1) Check the electrolyte level in each cell weekly. Add enough distilled or clean water to hold the level one-half inch above the plates.

(2) Keep the terminals tight and clean. A thin coating of grease at the terminals will prevent corrosion.

(3) If any electrolyte has been spilled, or if the batteries are dirty, wash the surface carefully with baking soda solution and dry.

(4) Using a hydrometer, check the specific gravity

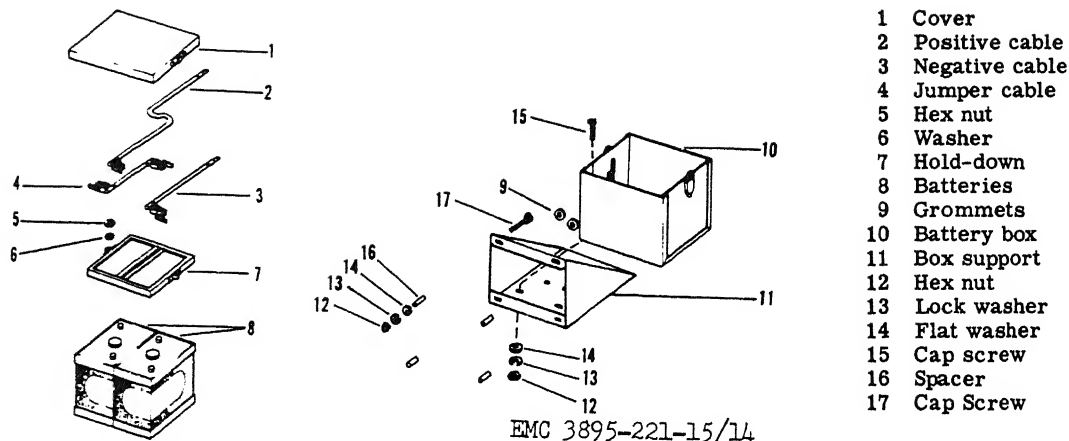


Figure 14. BATTERIES, CABLES, AND STORAGE BOX.

of the electrolyte in each cell each week. Record the reading on DA Form 464. A reading of 1.270 to 1.285 indicates fully charged batteries; 1.200 to 1.215, half-charged; and 1.125 to 1.140, discharged.

**NOTE:** Do not take test readings directly after adding water. Run the equipment for a few hours before taking a hydrometer reading.

(5) If the specific gravity reading is below 1.225 or the batteries fail to turn the engine over fast enough to start, charge the batteries. During normal operation of the engine, the batteries will be charged by the generator. If the engine is shut down for any length of time or if one battery has a lower charge than the other, remove them from the battery box for charging. A battery with a cell that will not take or hold a charge must be replaced.

(6) Take a voltage reading of all cells each week and record the reading on DA Form 464. The voltage of a fully charged cell is 2.1 volts; a voltage reading of 1.75 indicates a discharged cell. Each cell of a battery will read approximately the same voltage. If the voltage of one cell in any battery is approximately 0.2 volt below the other cells, the cell is defective. Replace the battery.

#### 64. BATTERY BOX

**a. Removal and Installation.** Remove and install the battery box and its components as shown in Figure 14.

**b. Cleaning and Repair.** Scrape the parts clean of accumulated crusted electrolyte using a suitable knife and a stiff bristle brush, and then wash with a solution of baking soda and water. Rinse with clear water and dry completely. Discard parts destroyed through corrosive action of the electrolyte.

#### 65. SPARK PLUGS AND SHIELDED CABLES

**a. Removal (Fig. 15).**

(1) Detach and tag each of the four ignition cables (2) by unscrewing hex collar (1) from the spark plug (6) and hex collar (3) from the magneto.

(2) Remove screw, lockwasher, and nut on ignition cable brackets and remove the cables.

(3) Wipe dirt from around spark plug holes, being careful not to get dirt or dust in the holes. Unscrew the four spark plugs (6) from the cylinder head and remove gaskets (5).

#### **b. Cleaning and Inspection.**

(1) Inspect each plug for worn or dirty electrodes and cracks or chips in the insulation. If the plug is dirty or fouled, but in otherwise good condition, clean in a spark plug cleaner. Replace plugs which are not in good condition.

(2) Inspect the ignition cables for frayed shielding and damaged insulation. Examine cable nuts for cracks, breaks, and stripped threads.

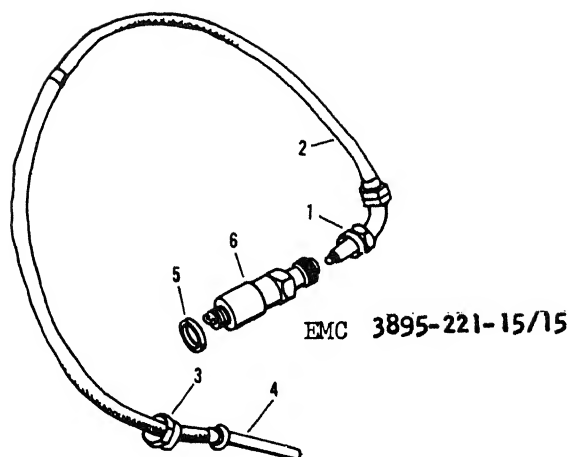
**c. Gap Adjustment.** Check the electrode gap of each spark plug with a wire feeler gage. A gap of 0.025 inch must be maintained between the center and outer electrodes. Adjust gap, if necessary, by carefully bending the outer electrode.

#### **d. Installation (Fig. 15).**

(1) Place a new gasket (5) on the plugs (6), and screw the plugs into the cylinder head.

(2) Insert terminal end (4) of ignition cable (2) into the proper magneto receptacle and screw on the hex collar (3).

(3) Insert terminal at the opposite end of the cable in the proper spark plug (6) and screw on hex collar (1).



- 1 Hex collar, plug end
- 2 Ignition cable
- 3 Hex collar, terminal end
- 4 Terminal end
- 5 Gasket
- 6 Spark plug

Figure 15. SPARK PLUG AND SHIELDED CABLE.

(4) Insert cables in the ignition cable brackets and secure with screw, lockwasher and nut.

#### 66. GENERATOR AND BELTS

##### a. Removal (Fig. 4).

(1) Disconnect the generator shielded cable (14) from the generator terminal (15).

(2) Loosen nuts (16) securing the generator (3) to the front and rear mounting brackets (13 and 10).

(3) Remove the cap screw and lockwasher securing the generator to the adjusting bracket (17); pivot the generator toward the engine as far as possible and slip off the fan belts (18) from the pulley (19).

(4) Support the generator and remove nut, lockwasher, and bolt from the front mounting bracket (13); follow the same procedure to free the generator from the rear mounting bracket (10), and remove the generator.

##### b. Inspection and Service.

(1) Loosen screw and remove the cover band (20, Fig. 4) to expose the commutator end of the generator. Inspect the commutator and brushes.

**CAUTION:** Do not use emery cloth to clean a commutator or to seat brushes. The abrasive material will cause short circuits and seriously damage the electrical equipment.

(2) The commutator should have a polished surface. If it is dirty, run a strip of No. 00 sandpaper under the brushes and hold with the abrasive side against the commutator while turning the engine over a few times.

(3) If there are high ridges of mica between the commutator segments or worn spots on the commutator, remove the generator and replace with a serviceable unit.

(4) See that the brushes move freely in their holders. Replace the oil-soaked brushes and those that are worn to half their original length.

##### c. Replacing Brushes.

(1) Remove screw connecting the brush holder. Hold the brush tension spring up while removing the brush.

(2) Install a new brush by holding the brush tension spring up while inserting the brushes into the holder. Release the spring and connect the brush lead to the brush holder with the screw.

(3) New brushes must be seated on the commutator. With the brushes in place, insert a strip of sandpaper between the brushes and commutator with the abrasive side against the brushes. Pull the strip back and forth until the brushes conform to the commutator surface. Use a coarse paper for a rough cut and No. 00 sandpaper for the finish cut. Blow out all sand and carbon dust with compressed air.

(4) Check tension of the brush spring with a spring scale. Hook the scale on the brush arm and pull directly in line with the brush holder. Correct tension should be between 25 and 26 ounces.

##### d. Installation (Fig. 4).

(1) Secure the generator to the front mounting bracket (13) with bolt, lockwasher, and nut (16); follow the same procedure to secure the generator to the rear mounting bracket (10). Do not tighten nuts until fan belt tension is adjusted.

(2) Pivot the generator toward the engine as far as possible and slip the fan belts (18) over the pulley (19).

(3) Secure the adjusting bracket (17) to the generator with cap screw (21) and lockwasher; do not tighten.

(4) Connect the generator cable (14) to the generator terminal (15).

(5) Adjust fan belt (step e).

e. Belt Adjustment (Fig. 4).

- (1) Loosen cap screw (21) and nuts (16).
- (2) Force the generator away from the engine to a position where a firm push with the thumb, at a point midway between the pulleys will depress the belt about 1/2 inch.
- (3) Hold the generator in this position and tighten the cap screw (21) on the adjusting bracket securing the generator in this position; tighten the nuts (16) on the front and rear mounting brackets (13 and 10). Check belt deflection.

**67. GENERATOR VOLTAGE REGULATION**

a. Preliminary Inspection.

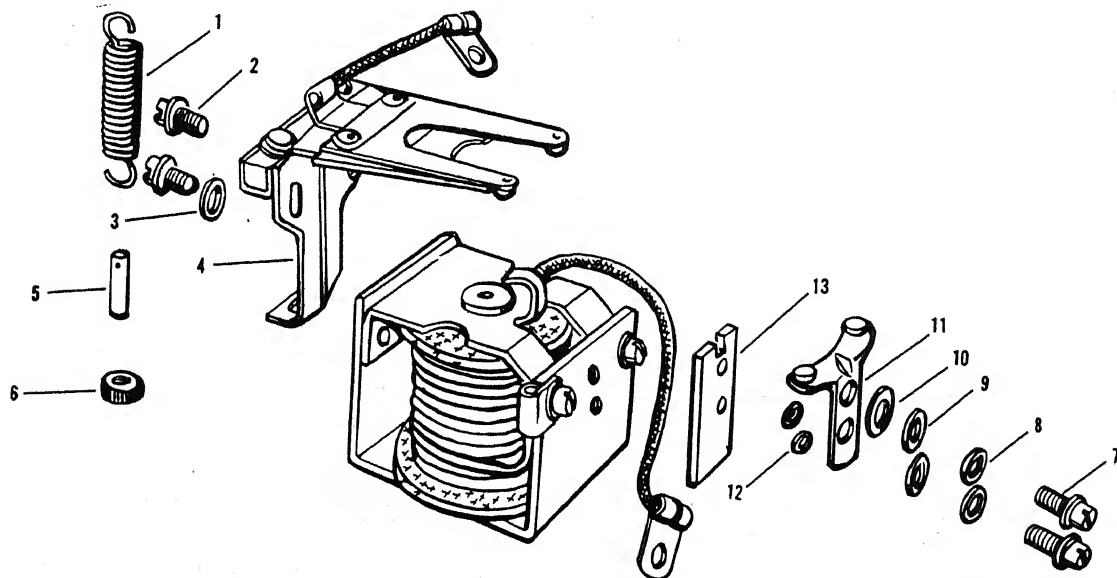
- (1) Check the wiring to see that it is properly connected to the generator and regulator (Fig. 6).
- (2) Make sure the generator operates correctly with-

out the regulator in the circuit. Remove the armature and battery leads from the regulator and connect an ammeter between them. Remove the field lead from the regulator and while operating at idle speed, touch the field lead to the regulator base. Increase the speed slowly noting the charging rate. DO NOT INCREASE THE OUTPUT ABOVE THE RATED OUTPUT OF THE GENERATOR. If the generator output will not build up, inspect the wiring harness for shorts and opens and remove the generator for overhaul.

(3) Check the specific gravity and terminal voltage of the battery. If the battery is not up to specifications, substitute temporarily for test purposes a fully charged battery of the same type and capacity.

(4) Inspect the wiring between the generator, regulator and battery for broken wires and high resistance connections. Pay special attention to the ground connection at all three units.

(5) Connect a reliable ammeter with 1 ampere graduations in series with the regulator "B" terminal and the lead removed from this terminal. Run the generator at a medium speed and turn on lights or accessories until



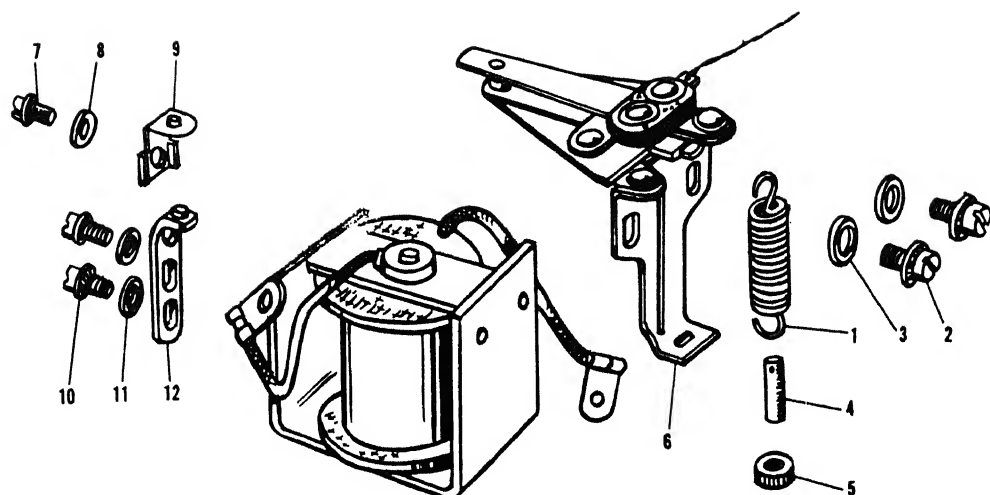
EMC 3895-221-15/16

- 1 Armature spring
- 2 Mounting screw
- 3 Mounting washer
- 4 Armature
- 5 Adjusting screw
- 6 Adjusting nut
- 7 Contact bracket screw

- 8 Contact bracket washer
- 9 Bracket insulation washer
- 10 Bracket washer
- 11 Stationary contact
- 12 Insulation bushing
- 13 Contact bracket insulation

Figure 16. HEAVY WIRE CIRCUIT BREAKER.





EMC 3895-221-15/17

- |                   |                              |                              |
|-------------------|------------------------------|------------------------------|
| 1 Armature spring | 5 Adjusting nut              | 9 Armature stop              |
| 2 Armature screw  | 6 Voltage regulator armature | 10 Bracket screw             |
| 3 Armature washer | 7 Armature screw             | 11 Bracket washer            |
| 4 Adjusting screw | 8 Washer                     | 12 Air gap adjusting bracket |

Figure 17. FINE WIRE CIRCUIT BREAKER.

the ammeter shows a 10 ampere charging rate. At this charging rate measure the voltage drop between the following points using an accurate voltmeter graduated in .1 volts divisions. The voltmeter should not show a reading above the maximum noted:

- (a) Generator "A" terminal to regulator "A" terminal - .15 volt max.
- (b) Generator "F" terminal to regulator "F" terminal - .05 volt max.
- (c) Battery terminal to regulator "B" terminal - .35 volt max.
- (d) Regulator ground screw to generator frame - .03 volt max.
- (e) Regulator ground screw to battery ground post - .03 volt max.
- (f) Generator frame to battery ground post - .03 volt max.

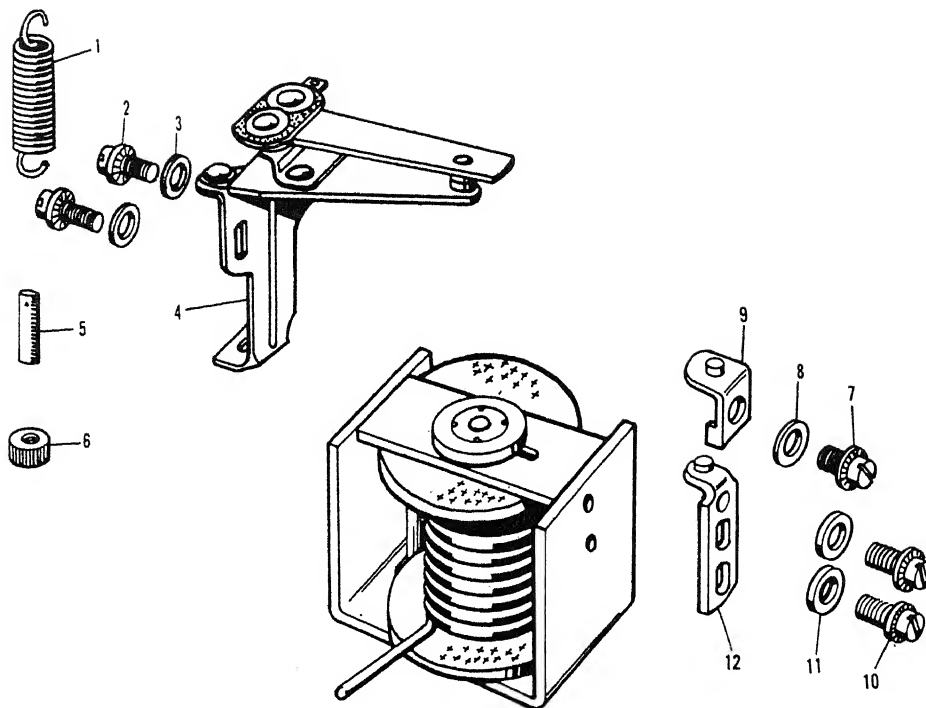
#### b. Test Procedure

- (1) Heavy Wire Circuit Breaker (Fig. 16).

- (2) Connect a reliable ammeter in series with the regulator "B" terminal and the lead removed from the terminal. Connect an accurate voltmeter from the regulator "A" terminal to the regulator base and place a reliable thermometer near the regulator (about 2 inches from the regulator cover but not touching the regulator).

- (3) Disconnect the field lead from the regulator "F" terminal and insert a variable resistance (3 amp. - 50 ohm) capacity between the lead and the regulator terminal. (If no variable rheostat is available, increase engine speed slowly from idle to control the generator voltage.)

- (4) Run the generator at about 1000 generator R.P.M. Insert all the resistance in the field circuit, then slowly reduce the resistance noting the voltage reading just before the change caused by the closing of the circuit breaker. Increase the charging rate to the figure



EMC 3895-221-15/18

- |                              |                   |                              |
|------------------------------|-------------------|------------------------------|
| 1 Armature spring            | 5 Adjusting screw | 9 Armature stop              |
| 2 Armature screw             | 6 Adjusting nut   | 10 Bracket screw             |
| 3 Armature washer            | 7 Stop screw      | 11 Bracket washer            |
| 4 Current regulator armature | 8 Stop washer     | 12 Air gap adjusting bracket |

Figure 18. CENTER CURRENT REGULATOR.

specified for the regulator being tested, then reduce the charging rate by inserting resistance in the field circuit. Note the ammeter reading just before the circuit breaker opens and the ammeter reading drops to zero. The closing voltage and the opening current should be within the limits specified.

(5) An accurate method for noting the exact instant of opening or closing of the circuit breaker is to connect a headphone (2000 ohms or higher) to the battery and armature terminals of the regulator. Then the contact open or close click will be heard in the headphone.

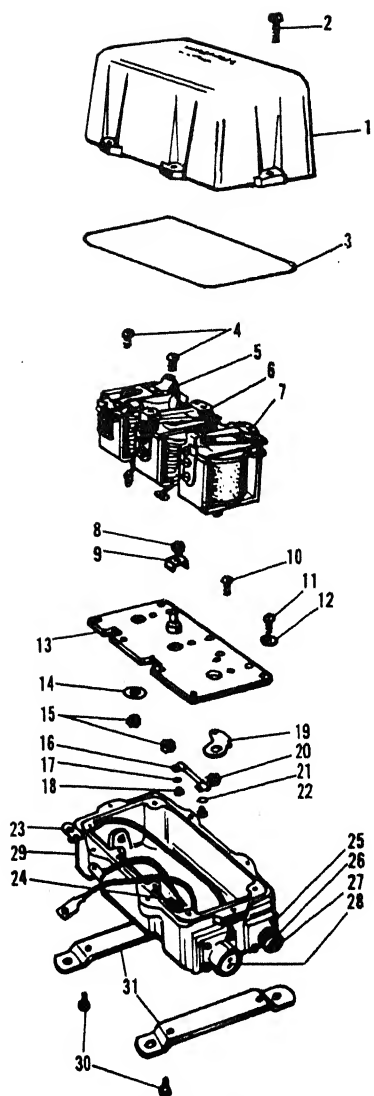
(6) To adjust the closing voltages change the armature spring tension by bending the hanger at the lower end of the spring. Increase the spring tension to raise the closing voltage or decrease the tension to lower the voltage. To adjust the opening voltage raise or lower the stationary contact keeping the contact perfectly aligned. Increasing the contact gap increases the opening current. Change the contact gap by expanding or contracting the stationary contact bracket, keeping the contacts aligned. Do not adjust the gap between the contacts to less than the specified minimum.

(7) Fine Wire Circuit Breaker (Fig. 17).

(8) Connect the ammeter as noted above and connect the voltmeter from the regulator "B" terminal to the regulator base. Remove the variable resistance from the field circuit.

(9) Run the generator at 10 amperes output for 15 minutes to make sure the regulator is at normal operating temperature. Have the cover on the unit during this warm up period and when taking readings.

(10) Stop the engine then bring it up to approximately 3000 generator R.P.M. Adjust to 10 amperes output by turning on lights or accessories and then note the voltmeter reading. This reading should be within the limits specified for the voltage regulator operation. To adjust the operating voltage change the armature spring tension by bending the hanger at the lower end of the armature spring. After each adjustment stop the engine, then restart it. Bring it up to speed and adjust the current before taking a reading. Be sure the cover is on the unit when taking readings.



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Figure 19. VOLTAGE REGULATOR ASSEMBLY.

(11) In order to obtain an accurate indication of the operation of the voltage regulator unit connect a headphone (2000 Ohms or higher) between the "F" terminal and ground to pick up the sound of the opening and closing of the contacts. The clicks should be regular and clear without irregularities or missing. If the tone is not clear and regular or if the meter fluctuation is excessive, remove the regulator cover and inspect the contacts. The contacts should be flat and not burned excessively and should be aligned to make full face contact. If the contacts need cleaning refer to paragraph 4 for the method.

(12) Center Current Regulator (Fig. 18).

(13) Connect the regulator and instruments as described above for the voltage regulator (paragraph (2)) and run the generator at approximately 3000 generator R.P.M.

- 1 Regulator cover
- 2 Cover mounting screw
- 3 "O" ring seal
- 4 Base mounting screw
- 5 Circuit breaker coil assembly
- 6 Current regulator coil assembly
- 7 Voltage regulator coil assembly
- 8 Lead connection nut
- 9 Series coil connection
- 10 Capacitor lead screw
- 11 Screw
- 12 Washer
- 13 Insulating base
- 14 Plain washer
- 15 Nut
- 16 Resistor
- 17 Washer
- 18 Screw
- 19 Resistor bracket
- 20 Mounting nut
- 21 Washer
- 22 Mounting screw
- 23 Pipe plug
- 24 Button resistor
- 25 Mounting screw
- 26 Receptacle
- 27 Capacitor and lead assembly
- 28 Receptacle and lead assembly
- 29 Base
- 30 Regulator mounting screw
- 31 Regulator mounting bracket

Turn on lights and accessories so that the generator must charge at its maximum rate. The ammeter should show a reading within the limits specified. To adjust the operating amperage change the armature spring tension by bending the hanger at the lower end of the armature spring. After each adjustment, stop the engine and restart it. Bring the engine up to speed and take an ammeter reading. Have the cover on the unit when taking readings.

(14) The current regulator unit is temperature compensated so that the controlled output varies with temperature. After the 15 minutes warm-up at 10 amperes the current regulator should control as specified for Test "A". If the regulator is hotter than this due to additional operation the controlled current will be lower. For an accurate check operate at full output for 15 minutes before checking current to Test "B"

(15) In order to obtain an accurate indication of the operation of the current regulator unit connect a headphone (2000 ohms or higher) between the regulator "F" terminal and ground to pick up the sound of the opening and closing of the contacts. The clicks should be clear and regular without irregularities or missing. If the tone is not clear and regular, remove the regulator cover and inspect the contacts. The contacts should be flat, not burned excessively, and should be aligned to make full face contact.

(16) Inspect the contacts on all three units. In normal use the contacts will become grayed. If the contacts are burned or dirty or if they are not smooth, file the contacts with a #6 America, Swiss cut, Equalling file. Move the file parallel and lengthwise to the armature. File just enough so that the contacts present a smooth surface toward each other. It is not necessary to remove every trace of pitting.

(17) After filing, dampen a piece of linen or lintless bond tape in refined carbon tetrachloride and draw the tape between the contacts. Repeat with a dry piece of tape. Use clean tape for each set of contacts.

(18) Operate the unit at 10 amperes output for 5 minutes with the cover on this regulator. Repeat the testing procedure for all units as described in paragraphs (1), (2) and (3) above. Be sure cover is on regulator when taking reading.

c. Removal and Installation. Disconnect the lead wires, remove attaching parts from mounting brackets (31, Fig. 19), and lift regulator (52, Fig. 3) from engine. Install by reversing removal procedures.

d. Disassembly and Reassembly. Disassemble and reassemble the voltage regulator components according to the numerical sequence of item numbers shown in Figures 16, 17, 18 and 19.

## 68. STARTER MOTOR

### a. Removal and Installation (Fig. 4).

(1) Disconnect and remove lead wires and cables (31, 32, 34 and 35, Fig. 6), remove the cap screws (33, Fig. 4), and withdraw the starter motor assembly (9) from the engine.

(2) Install the starter motor onto the engine bell housing by reversing the procedures of step (1).

### b. Clean and Inspect.

(1) Inspect the electrical leads, cables, and jumper wire for cracks, wear, and corrosion at the terminals. Wipe with a cloth dampened with an approved cleaning solvent and dry thoroughly. Inspect for worn, cracked, frayed, or oil-soaked insulation and replace defective parts.

(2) Clean the outside of the engine starter motor with a cloth dampened with an approved cleaning solvent and dry thoroughly.

(3) Remove the cover band and inspect the starter. If the starter is visibly worn or damaged, brushes do not seat properly on the commutator; or, if the commutator is rough and out-of-round, pitted, or has high mica, replace the starter or report to field maintenance.

(4) Position the cover band on the starter and secure by snapping cover band on the friction catch.

### c. On-equipment Testing.

(1) A periodic inspection should be made of the starting circuit. While the interval between these checks will vary according to the type of service, they should, under normal conditions, be made every 100 hours. At this check the following points should be inspected.

(2) The starting circuit should be inspected to be sure all connections are clean and tight and that the insulation on the wires is not worn or damaged. The starting circuit should be given a voltage loss test to make sure there is no loss of starting motor efficiency due to high resistance

connections. In making this check the voltage loss from the battery terminal to the starting motor terminal should not exceed .30 volts maximum for each 100 amperes. The loss in voltage between the battery ground post and the starting motor frame should not exceed .10 volts maximum for each 100 amperes. If the voltage loss is greater than the above limits the voltage should be measured over each part of the circuit to locate the resistance causing voltage loss.

(3) If the commutator is dirty or discolored it can be cleaned with No. 00 sandpaper. Blow the sand out of the motor after cleaning. Should the commutator be rough or worn the motor should be removed from the engine for cleaning and reconditioning.

(4) The brushes should slide freely in their holders and make full contact on the commutator. Worn brushes should be replaced.

## 69. MAGNETO

### a. Removal (Fig. 3).

(1) Disconnect the ignition switch lead from the magneto (69) terminal.

(2) Remove ignition cables and remove number one spark plug. Then crank the engine while holding finger over the hole to get number one piston up to top-dead-center. At the same time watch through hole in bell housing until markings appear showing that number one cylinder is at top-dead-center.

(3) Remove hex nut and washer from the bottom of the magneto housing.

(4) Support magneto and remove hex nut, flat washer, and star washer from the top of the magneto housing, and remove the magneto and gasket.

b. Installation. Reverse removal procedures. If engine was turned over with magneto removed, repeat step a. (2). Exercise care when engaging impulse coupling with slot in governor drive gear.

### c. Breaker Points and Condenser. (Fig. 20).

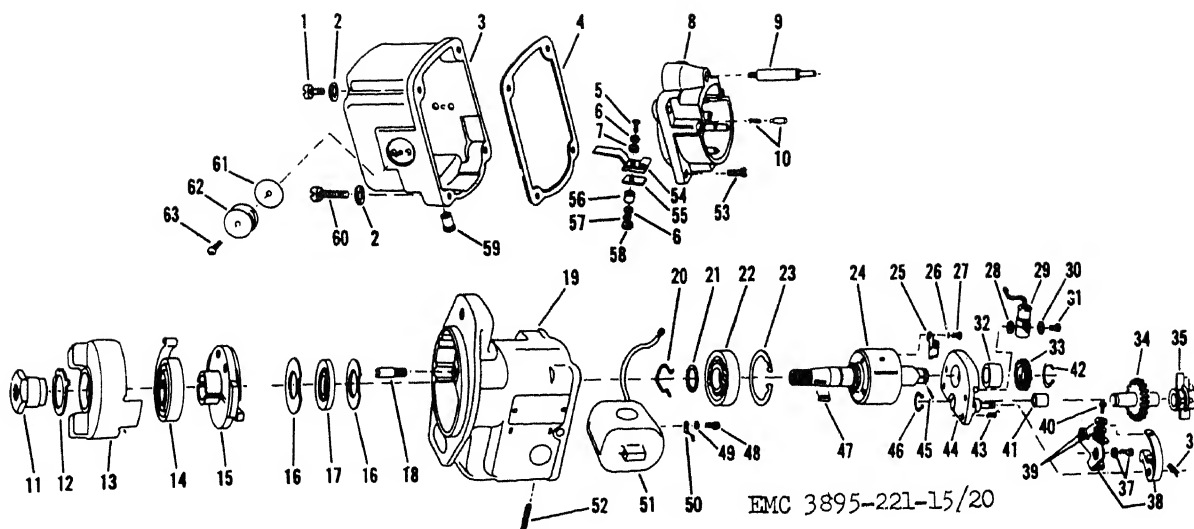
(1) Removal. Remove the four screws and lock-washers that secure the magneto end cap (3) to the magneto housing, and remove the end cap. Note the position of the rotor for correct installation and remove it.

(2) Remove the terminal screw (40) and washer (39) to release the capacitor (29) lead, coil (51) lead, and the movable contact spring.

(3) Remove the snap ring (36) from the pivot pin and remove the movable contact arm (38).

(4) Remove the contact support locking screw and washer (37), remove contact support locking screw (27), flat washer (26), and felt wick (25). Lift the stationary contact plate from the magneto.

(5) Remove screw (31) and washer (30) from the condenser band and remove the capacitor (29).



- 1 Machine screw
- 2 Lock washer
- 3 End cap
- 4 Gasket
- 5 Machine screw
- 6 Washer
- 7 Insulating washer
- 8 Distributor block
- 9 Lead suppressor
- 10 Electrical contact brush
- 11 Nut
- 12 Lock washer
- 13 Shell
- 14 Spring
- 15 Hub assembly
- 16 Inner washer
- 17 Rotor seal
- 18 Pin
- 19 Frame
- 20 Snap ring
- 21 Shim

- 22 Bearing
- 23 Drive end ring
- 24 Magnetic rotor
- 25 Cam/holder wick
- 26 Lock washer
- 27 Machine screw
- 28 Flat washer
- 29 Fixed capacitor
- 30 Flat washer
- 31 Machine screw
- 32 Bearing
- 33 Rotor gear
- 34 Gear assembly
- 35 Ignition rotor
- 36 Snap ring
- 37 Screw
- 38 Contact arm set
- 39 Flat washer
- 40 Screw
- 41 Bearing
- 42 Ring

- 43 Machine screw
- 44 Bearing support
- 45 Pin
- 46 Snap ring
- 47 Rotor key
- 48 Machine screw
- 49 Lock washer
- 50 Clip
- 51 Coil
- 52 Set screw
- 53 Machine screw
- 54 Primary ground
- 55 Guide strip
- 56 Bushing
- 57 Lock washer
- 58 Hex nut
- 59 Terminal insulation
- 60 Machine screw
- 61 Vent screen
- 62 Vent cover
- 63 Screw

Figure 20. MAGNETO ASSEMBLY.

(6) Installation. Position the stationary contact plate on the dowel pin and secure the left side of the plate with a lock washer and screw (37). With the felt wick (25) in place, secure the right side of the plate with the flat washer (26) and screw (27).

(7) Secure the movable contact arm (38) to the pivot pin with the snap ring (36). Attach the contact spring, coil lead, and condenser lead to the terminal with the lockwasher and screw (40).

(8) Adjust the gap of the breaker points as instructed in paragraph e.

(9) Position the ignition rotor (35) on the end of the shaft. Secure the end cap (3) with gasket (4) to the magneto frame (19) with the four screws and lockwashers.

d. Cleaning, Inspection, and Repair.

(1) With the end cap and distributor rotor removed, use a clean cloth to remove accumulated dust, grease, or moisture from the inside of the magneto frame and the breaker points assembly.

(2) Inspect the breaker points for signs of pitting, pyramiding, or otherwise unevenly worn surfaces.

(3) A fine tungsten file or stone should be used to re-surface worn points. Replace badly worn or pitted points. Adjust the breaker point gap as instructed in paragraph e, after re-surfacing points.

NOTE: If at any time the breaker points show signs of burning or pitting, install a new capacitor of the proper type.

#### Gap Adjustment.

(1) With the end cap and distributor rotor removed, turn over the engine until the movable contact arm is on the high point of the cam. Check the breaker points gap clearance with a feeler gage. The gap should be 0.018 to 0.020 inch.

(2) To adjust the gap, loosen the contact support locking screws, and move the stationary contact plate until the proper gap clearance is obtained. When the proper gap is obtained, lock the stationary contact plate in position by tightening the two locking screws.

(3) Take a final measurement of the breaker point gap after the locking screws are tightened.

#### f. Timing the Engine.

(1) Crank the engine over until the timing mark DC on the flywheel is visible through the inspection hole located above the starting motor in the flywheel housing. Make a white chalk mark on the flywheel in line with the timing mark DC, and a horizontal chalk mark on flywheel housing in line with the center of the inspection hole.

(2) Hook up a timing light, with the high tension lead to the No. 1 spark plug and the two leads remaining to the proper battery terminals.

NOTE: To connect timing light to No. 1 spark plug, disconnect the shielded lead to the spark plug. Insert a connector into the spark plug and attach the shielded lead to the connector. Then clip the high tension lead of the timing light to the connector.

(3) With the engine idling, direct the timing light into the inspection hole and check the position of the timing mark DC on the flywheel with the center of

the inspection hole. If the mark is past the center of the inspection hole before the flash occurs, the timing is slow. If the flash occurs before the mark gets to the center of the inspection hole, the timing is fast.

(4) Loosen hex nut on top of the magneto housing and hex nut on the bottom of the magneto housing so that the magneto body may be turned freely. To advance the timing, turn the magneto body very slightly in a clockwise direction. To retard the timing, turn the magneto body very slightly in a counterclockwise direction.

(5) After making any timing adjustments, recheck the timing again with the timing light.

(6) Tighten hex nut on the top of the magneto housing and hex nut on the bottom of the housing, securing the magneto in this position.

### 70. SWITCHES AND LIGHTS

a. Removal and Installation. Remove and install the switches and lights of the engine electrical system at their proper location as shown in Figures 6 and 3.

#### b. Cleaning, Inspect, and Repair.

(1) Wipe parts clean with a cloth dampened in an approved cleaning solvent, and dry thoroughly.

(2) Inspect for broken, deteriorated or otherwise unserviceable lead wires. Closely inspect terminal or connection ends for burned or distorted areas. Check for proper ground connections.

(3) Discard switches, lights, and wiring found defective, and replace them with new parts having the same part numbers.

## Section VII. COOLANT SYSTEM

### 71. GENERAL

The engine coolant system consists of a radiator, combination fan and water pump, thermostat, and the hoses through which the coolant is constantly circulated. In addition to being the storage reservoir for the coolant, the radiator's main purpose is to dissipate excessive coolant temperature through the tube and fin construction of the radiator. Correct engine operating temperature is maintained by a thermostat located in the engine cylinder head and connected to the radiator with hoses, by controlling the flow of coolant through the radiator. A four-bladed fan, mounted ahead of the radiator, forces air through the fins of the radiator and accelerates the process of cooling the liquid. The belt-driven, centrifugal type water pump circulates the coolant through the engine block, cylinder head, and radiator through the hoses.

### 72. HOSES, CLAMPS, LINES AND FITTINGS

a. Removal and Installation. Removal and installation of the coolant conveying hoses and lines (Fig. 33) is accomplished upon removal and installation of their respective clamps, connectors, and fittings in their obvious manner.

#### b. Inspect.

(1) Inspect all hoses for cracks in outer surfaces; squeeze by hand along the entire hose length and test for wall strength. Hoses with cracks, and are easily compressed, indicate that the hoses have started to rot internally and are to be discarded.

(2) Inspect for signs of leakage at hose ends; if the screw-type clamps cannot be tightened further, or are defective, discard and replace with new clamp. It is good practice to use new clamps when new hoses are installed.

c. Repair. Repair of these parts is limited to discarding defective parts and installing new parts having the same part numbers. Do not attempt replacement without first draining the coolant system of its contents at plug (7, Fig. 8).

### 73. THERMOSTAT

#### a. Removal (Fig. 21).

(1) Drain radiator and block by opening drain plug (7, Fig. 8).

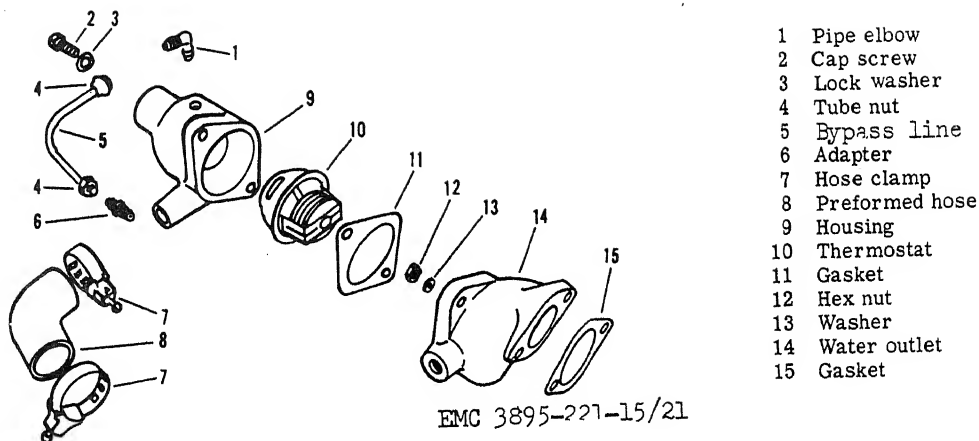


Figure 21. THERMOSTAT AND HOUSING

(2) Loosen hose clamps and remove hose connecting radiator and thermostat housing (9, Fig. 21 ).

(3) Loosen clamps (7) and remove hose (8) connecting thermostat housing and water pump.

(4) Remove bypass line (5) by loosening connector nuts (4); remove elbow (1) from the thermostat housing (9) and the bypass connector (6) from the water pump.

(5) Remove two cap screws (2) and lock washers (3), and lift off the thermostat housing gasket (11); remove thermostat (10) which is inside thermostat housing.

(6) Remove two nuts (12) and lock washers (13) holding the water outlet (14) to the cylinder head; remove gasket (15).

#### b. Cleaning and Repair.

(1) Thermostat should be washed out thoroughly to remove any rust that may have accumulated on it.

(2) Inspect thermostat for proper seating. Seat should be closed when the thermostat is cold. If seat remains open, thermostat is defective; replace it.

(3) Inspect the thermostat housing and water outlet neck for cracks or other defects which may result in leakage.

(4) Check the condition of the water hoses and bypass line.

(5) Replace both gaskets.

#### c. Installation (Fig. 21).

(1) Install the gasket (15) on the cylinder head; center the water outlet (14) on the head and secure with two nuts (12) and lock washers (13).

(2) Place the thermostat (10) in the water outlet;

then slide the thermostat housing (9) with gasket (11) in place down over the thermostat, and secure in position with two cap screws (2) and lock washers (3).

(3) Install elbow (1) in thermostat housing and bypass connector (6) in the water pump. Attach bypass line (5) to both with connector nuts (4).

(4) Install the hose connecting radiator and thermostat housing; install hose (8) connecting thermostat housing and water pump, and secure with clamps (7).

(5) Install and close engine drain plug (7, Fig. 8), and refill cooling system. Refer to Table II.

#### 74. FAN BELTS

a. Remove and Install. Remove and install the fan belts (18, Fig. 4) as outlined in paragraphs 66a (3) and 66d (2).

b. Belt Adjustment. Adjust the fan belts as outlined in paragraph 66e.

#### 75. FAN

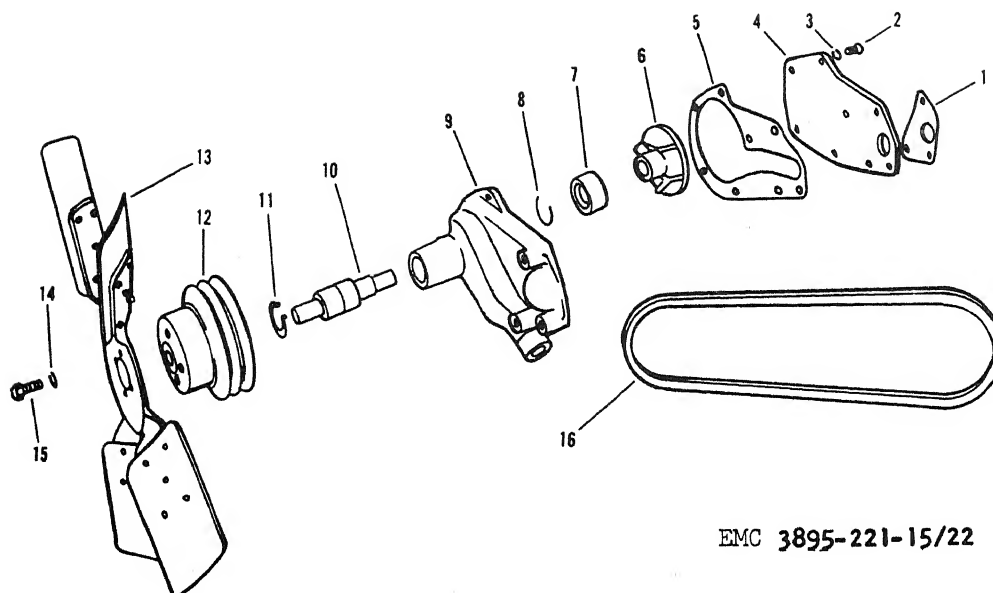
##### a. Removal (Fig. 22).

(1) Although difficult, it is possible (emergency only) to remove the fan without first removing the radiator.

(2) Remove the four cap screws (15) and lock washers (14) that secure the fan blade (13) to the fan pulley (12), and withdraw the fan from the pulley.

b. Install. Secure the fan to the fan pulley with its attaching parts.

c. Repair. Carefully straighten bent or warped fan blades, being sure to retain the original blade pitch. Discard a cracked, badly bent, or out of line fan assembly, and replace it with a new assembly having the same part number.



1 Gasket	5 Gasket	9 Pump body	13 Fan blade
2 Cap screw	6 Impeller	10 Shaft assembly	14 Lock washer
3 Washer	7 Seal assembly	11 Retaining ring	15 Cap screw
4 Pump cover	8 Retaining ring	12 Drive pulley	16 Drive belt

Figure 22. FAN AND WATER PUMP

## 76. WATER PUMP

### a. Removal.

(1) Drain coolant system at plug (7, Fig. 8), remove radiator and shroud (par. 137), and remove fan (par. 75).

(2) Remove water pump to thermostat bypass line (5, Fig. 21), remove fan belts (par. 66a (3)), remove the attaching parts that secure the water pump body (9, Fig. 22) to the engine, and withdraw the pump as an assembly.

### b. Disassembly (Fig. 22).

(1) Use a puller to remove the press fit pump pulley (12).

(2) Remove the outer retaining ring (11) from the pump body (9).

(3) Remove five cap screws (2) and lock washers (3) to remove the pump cover (4) and gasket (5).

(4) Support the pump body (9) at suitable points and press the shaft and bearing assembly from the pump body; remove the inner retaining ring (8) from the groove on the bearing.

(5) Press the seal assembly (7) out of the pump body.

### c. Cleaning and Repair.

(1) Use a wire brush to thoroughly clean the rust scale from the inside of the pump body. Inspect the body and cover for cracks.

(2) Check the impeller for pitting or chipped blades; replace if necessary.

(3) Check the pulley for cracks or other damage, and replace if necessary.

(4) Check seal spring for fatigue condition. Replace as an entire assembly.

(5) Check the bearing and shaft assembly for general condition. If the bearing binds or the shaft appears discolored, replace as an assembly.

### d. Reassembly (See Fig. 22).

(1) Press the seal assembly (7) into the pump body (9).

(2) Install retaining ring (8) in the groove on the bearing and shaft assembly into the pump body and secure with the outer retaining ring (11).

(3) Apply a thin coat of grease on the shaft and press on impeller (6) flush with end of the shaft. 0.031 inch is the proper clearance between impeller and pump body.



(4) Install pump pulley (12) as in Step d (3) above, flush with end of the shaft.

(5) Install new gasket (5) and pump cover (4), and secure with five cap screws (2) and lock washers (3).

e. Installation. Install the water pump assembly by reversing the procedures outlined in paragraph 76a. Service the coolant system (Table II).

## 77. WATER JACKETS

The water jackets are actually the preformed metal water conveying lines outlined in paragraph 72. Remove, inspect, and install the jackets according to these instructions.

## 78. RADIATOR AND SHROUD

### a. Cleaning and Flushing Radiator.

(1) Cleaning. Keep air passages through the radiator core clean by frequent cleaning, with compressed air under 40-psi pressure. For best results, air should be applied in the opposite direction to flow of air.

(2) Neutralizing. To thoroughly clean out the cooling system, the temperature of coolant should be raised to approximately 190° F. by operating the engine with the radiator covered as much as required. Add a standard issue flushing agent in recommended proportions to cooling liquid and allow engine to run approximately 15 minutes at the high temperature. This should loosen the major portion of scale and oxidation from the water passages and thoroughly neutralize any acid condition.

(3) Flushing. Entire cooling system should then be drained and flushed with water in order to thoroughly wash out all deposits loosened by the boiling-out operation. Engine must be allowed to cool down thoroughly before being flushed with cold water; otherwise, there is danger of cracking the cylinder block.

(4) Leaks. After the preceding operations are completed, all water connections and passages must be inspected for leaks as it is quite possible that some may be

uncovered by removing the scale and other deposit. It may be necessary to replace some of the hoses if inspection shows them to have cracks or thin walls, an indication that internally the hose has begun to rot.

(5) Coolant Service. Level of liquid in cooling system must be maintained above the radiator inlet of the engine. To do this it is necessary that this be checked at least daily. If the unit is operated for long periods in high altitudes or high temperature areas, it will be necessary to check more often.

b. Shroud Repair. Repair of the radiator shroud is limited to pounding out minor dents and distortions and protecting bare metal surfaces by applying paint. Discard and replace a shroud that is beyond these repair procedures.

## 79. WATER TEMPERATURE GAGE SENDING UNIT

The water temperature gage (35, Fig. 3) is on the engine hood. Its purpose is to indicate the running temperature of the engine; this is accomplished by means of a cable connected to the gage and a sensing or sending unit (5, Fig. 4) installed into the drum side, rear end of the engine head. The normal operating temperature of the engine is between 160° F. and 180° F. As the water circulates through the running engine, it warms up to a temperature within this range, and indicates the exact water temperature on the water temperature gage which is calibrated from 100 to 200 degrees Fahrenheit.

a. Removal and Installation. Unscrew the sending unit from the backside of the engine head, detach the opposite end of the cable from the water gage, and withdraw the assembly from the cable support located on top of the engine. Install by reversing this procedure, being sure that connections are clean and secure.

b. Cleaning and Repair. Wipe the sending unit clean, using a cloth saturated with an approved cleaning solvent. Dry thoroughly. If the sending unit transmits temperatures other than those which are considered normal, and the coolant system is properly serviced, the sending unit must be assumed defective and is to be discarded and replaced with a new unit having the same part number.

## Section VIII. LUBRICATION SYSTEM

## 80. GENERAL

The engine lubricating system is a pressure type arrangement, with the pressure being supplied by a gear type oil pump which is located in the engine oil pan. Oil is supplied to the oil pan through the oil filler tube (60, Fig. 3) which is equipped with a filler cap. Oil vapors are exhausted from the crankcase through tube (30, Fig. 33). The oil pump circulates the oil supply from the oil pan up and into a full flow oil filter, through tubing to the internal moving parts of the engine, and then returns through ports provided for, by gravity flow, back into the oil pan where the cycle is repeated as long as the engine is running. The oil filter (28, Fig. 3) retains minute particles of dirt suspended in the oil as the oil passes through the filter, thereby allowing only clean and protective oil from reaching the moving parts.

## 81. OIL FILTER

a. Removal and Installation (Fig. 23). Disconnect the oil filter inlet and outlet supply lines (8, Fig. 4) at the elbows installed in the upper side and bottom of the filter. Remove the attaching parts that secure the filter mounting straps to the air cleaner and filter mounting bracket. Install the oil filter by reversing these procedures. Check for leakage at elbows.

### b. Disassembly and Reassembly (Fig. 23).

(1) Remove the cover cap screw (1) and carefully lift the cover (3), spring (4), and gasket (5) from the filter body (7).

(2) Disassembly is complete upon lifting out the

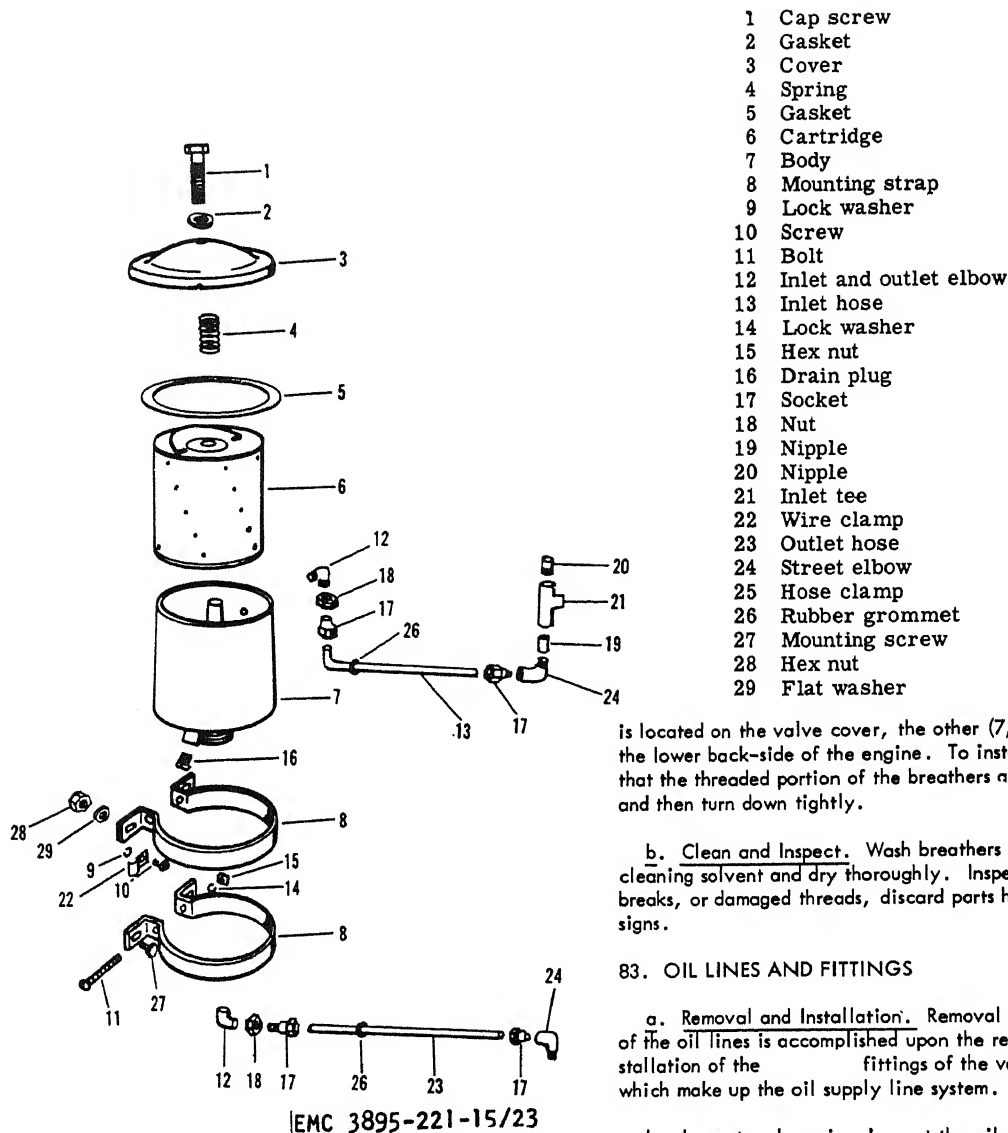


Figure 23. OIL FILTER ASSEMBLY.

filtering cartridge (6) and discarding it. Do not remove the spacer located on the body centertube.

(3) Reassemble the oil filter assembly by reversing the procedures of the two preceding steps.

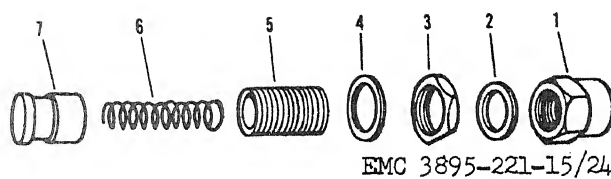
c. Cleaning and Repair.

(1) Wash all parts in an approved cleaning solvent and dry thoroughly, being sure that all foreign particles have been removed.

4 the cartridge, gasket, and all other severe dents, and damaged threads.

\*HFRS

on. The crankcase breathers in type. One (30, Fig. 33)



- 1 Cap nut
- 2 Gasket
- 3 Hex nut
- 4 Gasket
- 5 Screw
- 6 Spring
- 7 Piston

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Figure 24. OIL PRESSURE RELIEF VALVE.

a. Removal and Installation. Disconnect the oil pressure gage sending unit cable at the crankcase breather (7, Fig. 4) and at the rear of the oil pressure gage (34, Fig 3). Reverse procedure to install.

b. Cleaning and Repair. Wash sending unit in an approved cleaning solvent, and blow dry with compressed air. If oil pressure readings were erratic during engine operation, install a new sending unit and re-check gage readings. If situation is not corrected, trouble is in gage and must be replaced.

## 85. OIL PRESSURE RELIEF VALVE.

### a. Removal and Disassembly (Fig. 24).

(1) Remove the acorn cap nut (1), gasket (2), nut (3), and gasket (4).

(2) Remove the adjusting screw (5), and lift out the spring (6) and valve piston (7).

### b. Cleaning and Inspection.

- (1) Wash all parts thoroughly in cleaning solvent.
- (2) Check the valve plunger for wear and scoring or other damage; replace if necessary.
- (3) Check the spring for loss of tension or other

defects and replace if necessary.

### c. Reassembly and Installation.

(1) Insert the valve piston (7) and spring (6) in the opening in the block. Screw the adjusting screw (5) about halfway in, and secure with gasket (4) and nut (3).

(2) Install gasket (2) and acorn cap nut (1) on the adjusting screw (5).

(3) Start the engine and check oil pressure. If pressure is below 15 or over 25 pounds at running temperature, adjust oil pressure (step d).

NOTE: The oil pressure should not be judged to be too high or too low until it is known that the proper weight of oil is being used and that the engine is warmed up to normal operating temperature.

### d. Adjustment.

- (1) Remove acorn nut (1) and gasket (2).
- (2) Loosen nut (3) and turn adjusting screw (5) clockwise to increase oil pressure and counterclockwise to decrease oil pressure.
- (3) After desired pressure is obtained, tighten nut (3) and install gasket (2) and acorn cap nut (1).

## Section IX. EXHAUST SYSTEM

### 86. GENERAL

The engine exhaust system consists of a muffler, its standpipe, and the intake and exhaust manifold casting. The manifold is attached to the upper right side of the engine block, and its purpose is to vent or exhaust the spent fuel vapors after their combustion in the chambers of the engine. The standpipe is screwed into the top port of the manifold flange in a vertical position, and the sound-deadener muffler is secured to its uppermost end.

### 87. EXHAUST PIPE AND MUFFLER

a. Removal and Installation. Unscrew the muffler and standpipe (29, Fig. 3) from the large port on top of the intake and exhaust manifold (36, Fig. 33); unscrew to remove, being careful not to damage the threads or crack the manifold casting by twisting unevenly. Install by reversing procedures.

b. Cleaning and Repair. Clean the muffler and exhaust pipe with a stiff, wire-bristle brush, inspect for areas that have rusted through. Discard both parts if excessively rusted, dented, bent, or otherwise unserviceable.

### 88. INTAKE AND EXHAUST MANIFOLD

#### a. Removal.

- (1) Remove the carburetor (77, Fig. 3) (par. 59a).
- (2) Remove the muffler and exhaust pipe (par. 87a).
- (3) Remove the nuts and washers which secure the manifold (36, Fig. 33) to the engine crankcase.

b. Cleaning and Repair. Scrape away carbon from the manifold interior, then clean inside and out using a stiff

wire-bristle brush, and wash in an approved cleaning solution. Discard a manifold having cracks, chipped mounting surfaces, or other signs of unserviceability. Discard used manifold gaskets.

c. Installation. Install the manifold in essentially the reverse order of the removal instructions (par. 88a).

## 89. INTAKE AND EXHAUST VALVES

### a. Valve Cover Removal.

(1) Remove the intake and exhaust manifold (par. 88).

(2) Remove the two valve cover cap screws and carefully lift the cover and gasket from the side of the engine. Do not use any tool to pry the cover off, as it could possibly damage the sealing surfaces of the cover.

### b. Tappet Adjustment.

(1) Start the engine, warm to operating temperature, and set at fast idle speed.

(2) Valve clearance is accomplished by turning the adjusting screw either clockwise to increase clearance, or counterclockwise to decrease clearance.

(3) Using a blade feeler gage, set the exhaust valves 0.008 inch, and the intake valves at 0.006 inch.

c. Cover Installation. Reset the engine to normal idling speed, install the valve cover in the reverse procedures of step 89a (2), install the intake and exhaust manifold per paragraph 88c. Be sure to use a new gasket when installing the valve cover.

## Section X. CONTROLS AND INSTRUMENTS

### 90. GENERAL

The controls and instruments required for the operation of the concrete mixer are located on the forward wall of the engine hood, on a bracket to the lower left side of the air cleaner, and on the lower left side of the radiator front. The purpose of these controls and instruments has been outlined in Section II of Chapter 2.

a. Removal and Installation. The removal and installation procedures of the engine controls and instruments are all basically similar to each other, insofar as they are all installed from outside and through their mounting location holes, and secured from within by drawing up on a ring-type screw nut. Disengage or disconnect the cables and wires from their sockets or terminals. The following controls and instruments are involved:

(1) Choke control (6, Fig. 8).

(2) Governor control (42, Fig. 3).

(3) Ignition switch (3, Fig. 8).

(4) Battery Indicator (26, Fig. 3).

(5) Fuel gage (25, Fig. 3).

(6) Starter button (2, Fig. 8).

(7) Tach-hour meter (31, Fig. 3).

(8) Oil pressure indicator (34, Fig. 3).

(9) Water temperature gage (35, Fig. 3).

b. Clean and Inspect. Wipe gage glass with a clean, damp cloth, wipe cable with a solvent-saturated cloth, and blow accumulated dirt from instruments with compressed air. Discard items showing signs of damage, broken glass, and defective wires or cables.

## Section XI. BODY, HOOD AND HULL PANEL ASSEMBLIES

### 91. DESCRIPTION

The operating mechanism of the concrete mixer and of the engine is protected from adverse elements and bodily contact by means of guards, covers, hoods, and panels. Batteries are stored in a weather-proof box (15, Fig. 2), as are wiping cloths, tools, and whatever else the operator deems necessary, stored in the tool box (16, Fig. 2). These parts are fabricated from a suitable gauge sheet metal, and, as is the case of the battery and tool box, are lead coated to prevent corrosion or rust deposits.

### 92. TOOL BOX, STOWAGE RACKS, AND BOXES

a. Tool Box. The tool box (16, Fig. 2) is mounted at the forward left side of the mixer frame and contains the engine handcrank for emergency starting of the engine, as well as, other objects such as wiping cloths or items that

the operator might place therein for proper maintenance of the mixer. The box is supported by two angle iron brackets (18, Fig. 46) attached to the mixer frame leg support. Removal and installation of the tool box is accomplished upon the removal and installation of the bracket attaching nuts, washers, and cap screws. The tool box cover hinges are welded to the box and cover; removal of the cover is accomplished by tapping out the hinge pins. Discard damaged or unserviceable tool box and replace it with a new box assembly.

b. Battery Box. The battery box (15, Fig. 2) is mounted at the left rear of the mixer, and houses the two batteries required for the mixer 12-volt electrical system. See Figure 14 and refer to paragraph 63 for removal and installation procedures. Discard an unserviceable battery box, its cover (1), or its grommets (9), and install new parts having the same part numbers.

### 93. HOOD AND SIDE PANELS

a. Removal (See Fig. 2). Removal of the engine hood (33) can only be accomplished by first disconnecting the cables of the hood mounted instruments, the oil lines from the oil filter, air cleaner tube, and then removing the oil filter, air cleaner, and muffler. Removal is complete upon removing the attaching parts that secures the hood.

b. Repair. Pound out minor dents and distortions of the hood, and repair minor holes by welding according to standard practice. Discard a hood damaged beyond these services and install a new hood having the same part number.

c. Installation. Install the hood following the reverse procedures of step a.

d. Removal of the engine side panels (17 and 18, Fig. 2) is accomplished by pulling down and outward on the panel handles. Repair in same manner as for the hood.

### 94. DOORS

The only door required on the mixer, is located on the countershaft housing (7, Fig. 2). The door hinges are welded, but, removal could be accomplished by tapping the hinge pins out of the hinges. Repair the door as outlined in paragraph 93b.

### 95. INSTRUMENT OR DASH PANEL

a. Removal. Removal of the front control panel (9, Fig. 8) and the instrument mounting bracket (100, Fig. 3) is accomplished by performing the removal procedures as outlined herein for the components mounted on the panel and bracket, and then removing the attaching parts that secures them to the engine.

b. Repair. Discard the panel or bracket if their damage in any way distorts the instruments mounted on them.

c. Installation. Install the control panel and mounting bracket by reversing the procedures of step a. Test instruments for proper response after installation is complete.

## Section XII. POWER TRANSFER

### 96. DESCRIPTION

The mixer receives its driving power from the four-cycle, four-cylinder gasoline engine which is integrally connected to a power take-off assembly that transfers the engine power or drive to an output shaft and a countershaft. See Figure 53. The power take-off assembly houses a stub shaft (85) and sprocket (70); one end of the output shaft (67) and its driven sprocket (64); and the drive chain (63) that connects these two sprockets together. The outer end of the output shaft (67) embodies a drive sprocket (29), chain, and a manually-operated clutch which engages or disengages the sprocket with the engine drive. When engaged, the output shaft sprocket drives a countershaft assembly (Fig. 52) which also incorporates a driven sprocket (49), a drum drive sprocket (48), and its own manually-operated clutch assembly. The mixer drum chain (36) encircles the entire drum and meshes with the teeth of the drum drive sprocket (48). The drive sprocket is keyed to the countershaft; therefore, whenever the output shaft clutch is engaged, the countershaft and the mixer drum will rotate.

### 97. ADJUSTMENTS

Proper chain adjustment is essential for efficient chain operation and prolonged chain life. All chains must be checked regularly for tightness, but with enough slack to minimize strain.

a. Countershaft Drive Chain. Adjust for a slightly worn countershaft drive chain by adding shims under the engine base. If chain wear is excessive, remove one link and take out or add engine base shims until the chain will flex from 1/2 inch to 3/4 inch. Be sure engine mounting bolts and nuts have been tightened securely.

b. Drum Drive Chain. The countershaft support plates are secured to the upper and lower frames by bolts through

slotted holes in the plates. Loosen these bolts and move the countershaft assembly along the slots until the chain deflection is 1 inch to 1-1/2 inches. Tighten mounting bolts securely.

c. Sprocket Alignment. Check sprocket alignment by placing a straight edge across the faces or rims of the drive and driven sprockets. Tap into alignment as required. Always check for proper alignment whenever repairs or affecting adjustments have been made.

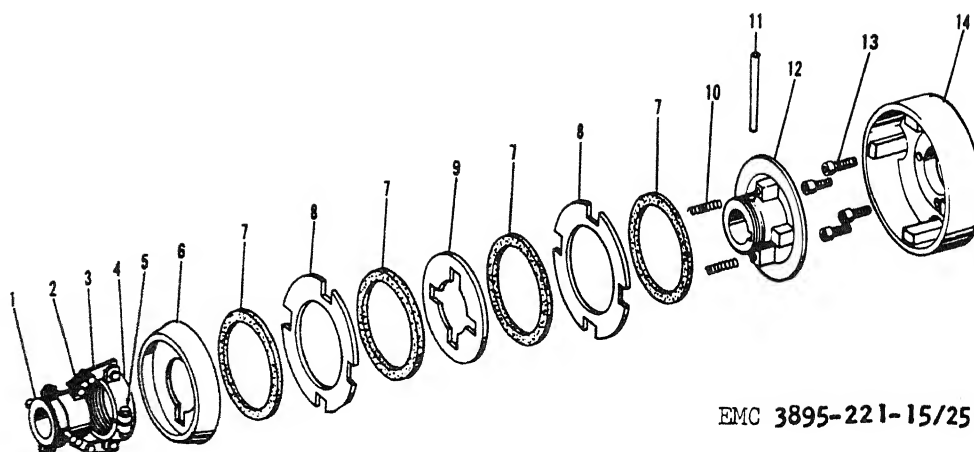
### 98. CLUTCH

Both the master and the power loader skip clutch assemblies are multi-plate types, which are operated by toggle links (2) (see Fig. 25) and fingers (3). The master disc (12), front plate (6), and the driving disc (9) constitute the driving members of the clutch. The driven discs (8) are separated from the driving members by fibre clutch facings (7) which are secured to the driven discs. When the clutch is engaged, the driving members are forced against the driven members by the toggles and fingers; all members then turn together and transmit power to the clutch housing (14).

Figure 25 illustrates the master clutch components. The power loader skip clutch components are essentially the same as the master clutch, except that more discs and facings are used, and also, the clutch housing (14) for the skip clutch is an integral part of the hoisting drum.

### 99. CLUTCH ADJUSTMENT

The adjustment of both master and power loader skip clutches are identical. See Figure 25. Loosen cap screws (5) and turn the adjusting collar (4) clockwise to tighten, or counterclockwise to loosen. Upon obtaining the desired setting, tighten the cap screws securely.



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- |                    |                 |                       |
|--------------------|-----------------|-----------------------|
| 1 Clutch spool     | 6 Front plate   | 10 Compression spring |
| 2 Toggle links     | 7 Clutch facing | 11 Locking pin        |
| 3 Fingers          | 8 Driven disc   | 12 Master disc        |
| 4 Adjusting collar | 9 Driving disc  | 13 Screw              |
| 5 Cap screw        |                 | 14 Clutch housing     |

Figure 25. TYPICAL CLUTCH COMPONENTS.

#### NOTE

The toggle members should "snap" over-center on the clutch operating lever with a minimum of pressure.

c. To increase the braking action of the brake band, screw the top nut (66) up (clockwise) on the rod, one-half to one full turn at a time until the desired setting is achieved. Secure setting by turning the lower nut up tightly against the other.

d. If the adjustment is too great, the brake band will not release enough to allow lowering of the skip. To correct this condition, reverse the procedures of step c, then operate the skip to determine whether proper adjustment has been achieved.

#### 100. CLUTCH KNOCK-OUT LEVER

A clutch knock-out lever (20, Fig. 1) is located to the right of the charging end opening. On the uppermost end of the lever is a square head set screw and jam nut. As the skip is raised, a pad on the skip comes in contact with the screw head, activating the lever arm which in turn disengages the skip clutch and automatically applies the skip brake.

#### 101. KNOCK-OUT LEVER ADJUSTMENT

The set screw head must be set high enough to actuate the knock-out lever (20, Fig. 1) whenever the skip comes within 1/2 inch of the winding shaft supports. Adjust this screw by turning it out more than necessary, and then gradually turning it back in until the proper setting is obtained. Be sure to lock jam nut securely, and operate skip to check setting again.

#### 102. SKIP CLUTCH BRAKE ADJUSTMENT

a. Lower the skip gradually until it rests on the ground. Open the countershaft housing (7, Fig. 2) access door and make sure that the brake lining is not binding on the brake drum.

b. See Figure 26. Loosen the lower of the two nuts (66) on the threaded end of the brake lining rod.

#### 103. BRAKE BAND MAINTENANCE

##### a. Removal (See Fig. 26).

(1) Lower the skip until it rests on the ground. Be sure that brake band is slack.

(2) Remove nuts (66), spacer (67), and pull the threaded rod end up through the brake release lever (72), washer (73), spring (74), and washer (75).

(3) Withdraw the two cotter pins (77) from the anchor pin (76), press out the anchor pin, and remove brake band and lining assembly (78).

##### b. Cleaning and Inspection.

(1) Wipe the brake band assembly clean with a dry cloth; wash all other parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect and discard all parts that are distorted, cracked, worn or otherwise unserviceable.

### c. Installing New Brake Lining.

(1) Punch out the rivets that secure the lining to the brake band and separate the two parts.

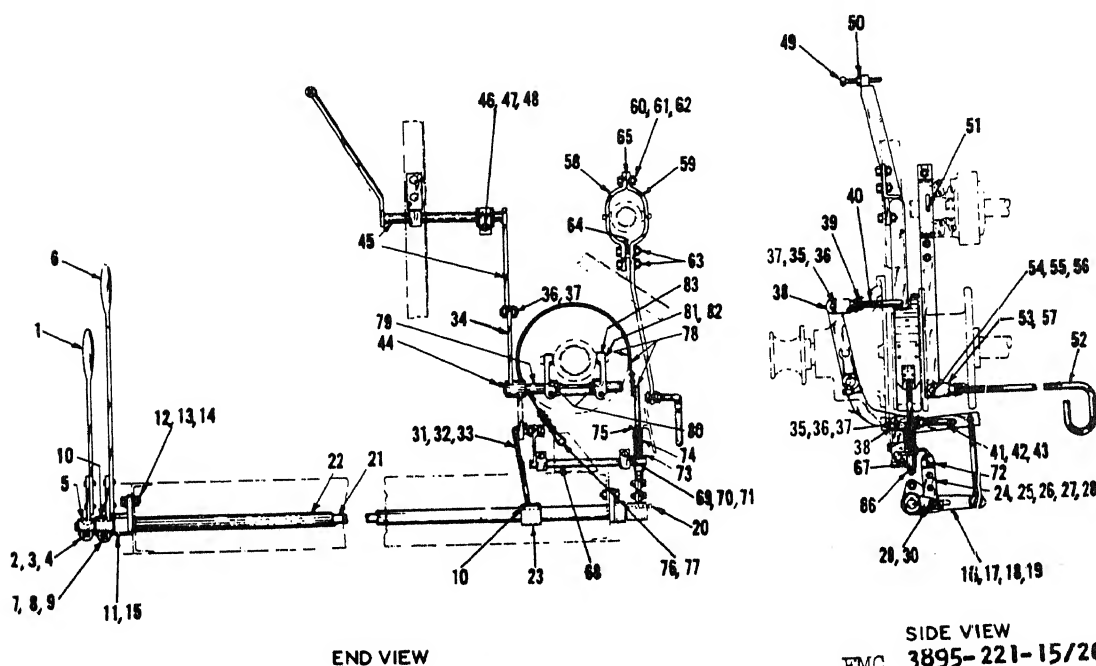
(2) Align the holes of a new brake lining over the holes of the brake band, insert new rivets, and stamp securely. Be sure that all burrs are removed from the inner side of the brake band.

### d. Installing Brake Band.

(1) Position the looped end of the brake band over the brake drum and aligned with the mounting hole. Secure in place with anchor pin (76) and cotter pins (77).

(2) Insert the threaded end of the brake band rod through the countershaft support hole, washer (75), spring (74), rocker washer (73), brake release lever (72), spacer (67), and then screw on the two hex nuts (66).

(3) Obtain the correct brake band tension by following the instructions outlined under paragraph 102.



END VIEW

SIDE VIEW  
EMC 3895-221-15/26

1 Brake lever	22 Clutch tube	42 Cotter pin	63 Cap screw
2 Hex nut	23 Clutch tube lever arm	43 Special washer	64 Pipe spacer
3 Cap screw	24 Brake control lower link bar	44 Gib key	65 Torsion spring
4 Lock washer	25 Friction gasket	45 Knockout lever bar	66 Hex nut
5 Woodruff key	26 Cap screw	46 Machine bolt	67 Spacer
6 Clutch lever	27 Hex nut	47 Hex nut	68 Brake release assembly
7 Hex nut	28 Lock washer	48 Lock washer	69 Hex nut
8 Cap screw	29 Cotter pin	49 Set screw	70 Machine bolt
9 Lock washer	30 Rivet pin	50 Jam nut	71 Lock washer
10 Key	31 Clutch controllink rod	51 Lube fitting	72 Brake release lever
11 Control tube bearing	32 Cotter pin	52 Hand rod	73 Rocker washer
12 Cap screw	33 Plain washer	53 End yoke	74 Compression spring
13 Hex nut	34 Clutch arm	54 Rivet pin	75 Plain washer
14 Lock washer	35 Rivet pin	55 Cotter pin	76 Anchor pin
15 Lube fitting	36 Cotter pin	56 Plain washer	77 Cotter pin
16 Brake shaft lever arm	37 Plain washer	57 Jam nut	78 Brake band
17 Hex nut	38 End yoke	58 Shifter lever half	79 Clutch throw-out shaft
18 Cap screw	39 Jam nut	59 Shifter lever half	80 Woodruff key
19 Lock washer	40 Link rod	60 Hex nut	81 Lube fitting
20 Gib key	41 Link rod	61 Lock washer	82 Pipe nipple
21 Brake shaft		62 Cap screw	83 Throw-out yoke

Figure 26. SKIP, CLUTCH, AND BRAKE CONTROLS

### Section XIII. MIXER DRUM AND CHUTE

#### 104. DESCRIPTION

The mixing drum assembly (3, Fig. 1) consists of a fabricated metal drum onto which is mounted drip rings over the charging and discharge openings. The discharge side drip ring is completely smooth and serves only to retain concrete from splashing out of the drum as it is being mixed. The charging side drip ring (11, Fig. 1) has lugs welded to it, so that as the drum rotates, rollers contact the lugs and vibrate the material in the skip into the drum while at the same time retaining the materials in the drum. See Figure 27. Bolted to the inside of the drum are five mixing buckets (8) and five mixing bucket and blade combinations (7). As the drum rotates, the aggregate within the drum becomes thoroughly mixed by the chopping action of the buckets and blades. Thirty-six sprocket segments (12) are bolted around the mixer drum forming one continuous sprocket which meshes with and receives the driving action of an endless chain. The drum revolves on, and is supported by four rollers which contact a track-shaped contour at both ends of the mixer drum. Upon being completely mixed, the concrete is discharged from the drum down a chute (1, Fig. 2) suspended from a hinged shaft that is remotely actuated by a handwheel (6, Fig. 2) through a gear case (19, Fig. 2) and linkage arrangement. Counterclockwise rotation of the handwheel lowers the outer end of the chute and also causes the inner end of the chute to enter the discharge opening of the mixer drum; as the drum revolves, the concrete mixture drops from the buckets and blades onto the inner end of the chute and flows out of the drum.

#### 105. MIXER DRUM

a. Upon removal of the discharge chute and shaft, the attaching parts of the buckets and blades are accessible through the opening, allowing for quick replacement of the buckets and blades as they become worn from contact with the abrasive concrete material.

b. In the event that segments of the drum sprocket become damaged and require replacement, access is gained

through the skip end of the drum. Be sure that all attaching parts are tightly secured and that grease is applied to the new segments.

c. Lubricate the roller-to-drum track, and also the roller bearings at the roller shaft-mounted lubrication fittings, as outlined in Lubrication Order (Fig. 9).

d. When interior of the drum becomes encrusted with hardened concrete due to careless cleaning or mixer operation under extreme heat conditions; revolve a load of stone in the drum, at full speed for a few minutes, until all concrete is loosened and may be flushed out with jets of water.

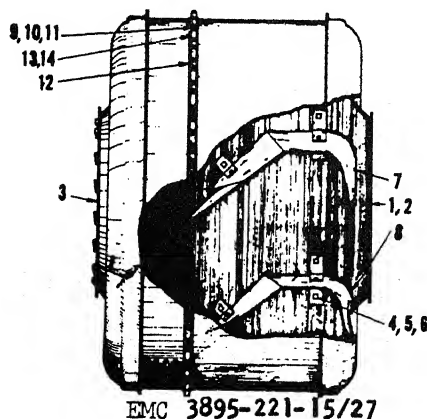
#### 106. MIXER DRUM DRIVE

Service the mixer drum drive chain and the drum sprocket segments as outlined in paragraph 105. Whenever the drive chain becomes too worn and these adjustments do not correct the chain slack, disassemble and remove one of the chain link assemblies from the chain length, and then connect the two chain ends. If the chain is unfit for continued service, remove it and replace it with an entire new chain length if one is available. Except for lubrication, no other service procedures are required for the drum drive sprocket, drum rollers or their shafts.

#### 107. DISCHARGE CHUTE

a. Adjustment (See Fig. 28). The upper link bar (5) and the lower link bar (4) are secured together with attaching parts mounted through slotted holes. Should difficulty be experienced in the discharge chute (16) not staying locked either in the up position or in the discharge position, loosen the nuts (7) at the slotted holes, move the handwheel (6, Fig. 2) so that the lower end of the lower link is to the right of center as the operator is facing the handwheel. Tighten the nuts securely and test chute operation. Repeat procedure until desired setting is achieved. Further adjustment may be made by turning in or out on set screws (4, Fig. 29).

b. Service. Refer to the Lubrication Order. No service is required on the discharge chute (16), chute shaft (22), or the sealing segment (10), all of Figure 28, except application of lubricant at the fittings indicated and at the intervals



- 1 Rivet
- 2 Discharge side drip ring
- 3 Charge side drip ring
- 4 Hex nut
- 5 Cap screw
- 6 Plain washer
- 7 Combination bucket and blade w/clips
- 8 Bucket w/clips
- 9 Hex nut
- 10 Carriage bolt
- 11 Lock washer
- 12 Sprocket segment
- 13 Sprocket base band
- 14 Drum shell assembly

Figure 27. MIXER DRUM COMPONENTS.



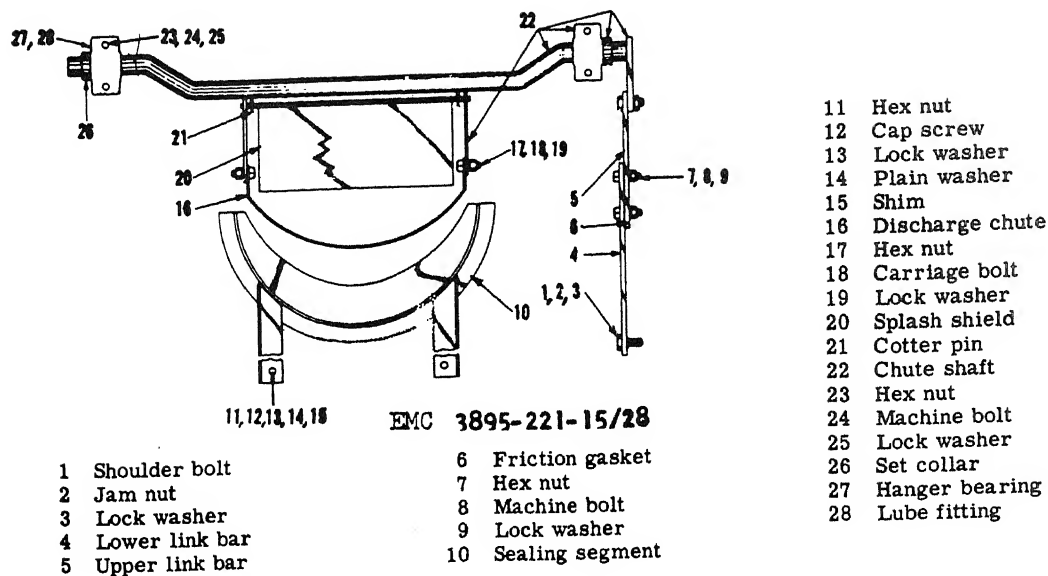


Figure 28. DISCHARGE CHUTE COMPONENTS.

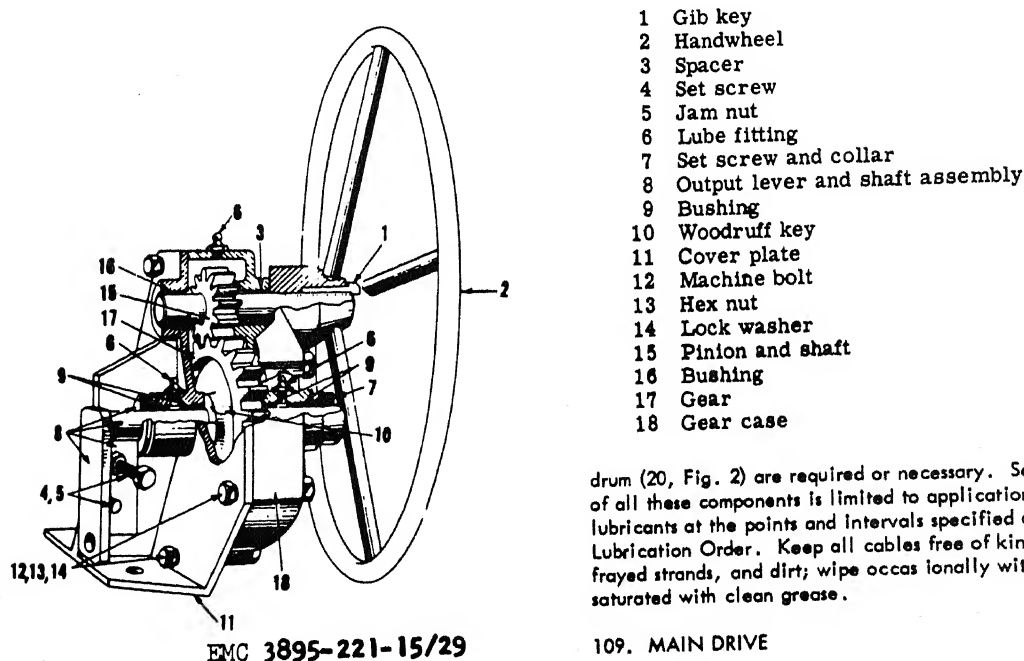


Figure 29. GEAR CASE AND HANDWHEEL

stated. Service of the handwheel and gear case of Figure 29 is limited to lubrication application at the three points and intervals indicated. Maintain all components in a clean, ready to use, condition at all times.

#### 108. POWER LOADER SKIP

a. Adjustment and Service (See Fig. 1). No adjustment of the skip (1), rollers (10), skip pivot shaft (21), top winding shaft (22), winding drums (9), or the reduction

drum (20, Fig. 2) are required or necessary. Service of all these components is limited to application of lubricants at the points and intervals specified on the Lubrication Order. Keep all cables free of kinks, frayed strands, and dirt; wipe occasionally with a rag saturated with clean grease.

#### 109. MAIN DRIVE

Adjustment of the main drive (Fig. 26) chains, sprockets, and shafts is limited to the instructions outlined in paragraph 97. Whenever chain slack cannot be corrected by inserting shims, it will then be necessary to remove one complete link and the shims.

#### 110. GUARDS, HOUSINGS, AND COVERS

All guards, housings, and covers are secured by means of nuts, bolts, or screws. Replacement is accomplished upon removal of these items, aligning the holes of a new part over the holes in the mounting surface, and then

securing with their respective attaching parts. Repairable covers and guards should be removed, hammered or welded into serviceable condition, and then re-mounted.

Paint as required and lubricate all hinges. Remove rust from exposed metal surfaces before prime and finish coats of paint.

#### Section XIV. MIXER WATER SYSTEM

##### 111. DESCRIPTION

The concrete mixer water system consists of an auxiliary water pump (13, Fig. 2), freeway valve assembly (13, Fig. 1), water supply tank (7, Fig. 1) with an air valve assembly, water tank level gage (9, Fig. 2) and the water volume control (12, Fig. 1). With the engine running, water is drawn from a source of supply (reservoir) by and through the water pump, where it is then forced through pipes to the freeway valve assembly. If the valve is set for water tank fill, water continues

through the valve and into the tank until its maximum level is reached, whereupon it automatically stops water flow. Although the pump and engine are still running, no more water will be induced into the freeway valve until an amount of water governed by the quadrant setting is discharged into the rotating mixing drum as the freeway valve lever (19, Fig. 1) is moved into the down or discharge position, and returned to its up or tank fill position. The water pump is belt driven from an engine pulley to the pump pulley. The water tank houses a bellows which siphons water from within the tank in the

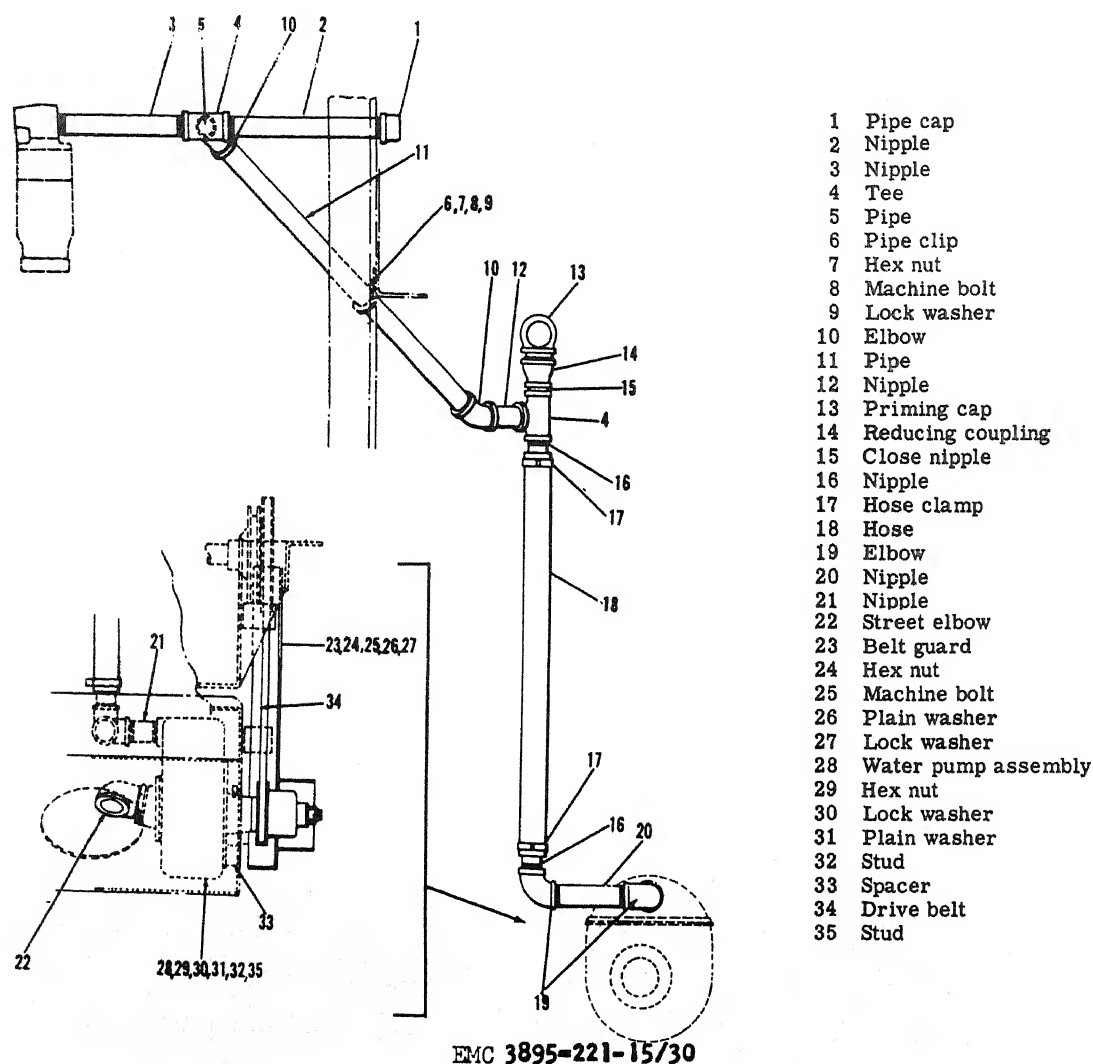


Figure 30. WATER PUMP AND SYSTEM PIPING.

amounts regulated by the water volume control (12, Fig. 1), and discharges it through piping to the drum. The water tank air valve assembly (23, Fig. 1) contains a check valve ball which allows air to flow out of the valve cap as water is pumped into the water tank, but does not permit water to escape through the same passage. The liquid level sight gage (9, Fig. 2) is simply a means of allowing the operator to maintain visible indication of the water remaining within the tank.

## 112. WATER PUMP

a. Service. No maintenance procedures are required of the pump proper; the bearings are lifetime lubricated and require no further lubrication unless the pump is disassembled for overhaul purposes. The pump may be drained as desired by removing a pipe plug located on the lower portion of the pump inlet face. After this has been done, it will usually be necessary to add water into the pump for priming purposes at cap (13, Fig. 30).

b. Adjustment. The water pump assembly (13, Fig. 2) is mounted to the housing wall directly under the fan end of the engine. The holes of the wall are vertically slotted, therefore; when deflection of the pulley belts exceeds 1/2 inch (determined by placing a straight-edge across the pulley grooves and pressing inward on the belt), loosen the pump mounting nuts, press down on the pump to tighten the belts, and then secure the nuts. Repeat this procedure until 1/2 inch, but no less, deflection of the belts is achieved.

### c. Replacement.

(1) See Figure 30. Loosen nuts (29), disconnect and remove all piping at the pump inlet and outlet, move the pump upward until the pulley belts can be removed from their grooves. Remove nuts completely and withdraw fan and pump assembly.

(2) Remove the drain plug from the lower inlet side of the pump and allow all water to drain from the pump. Install the plug and tag the pump for rebuild procedures.

(3) Position a new or rebuilt pump assembly over the slotted mounting holes in the housing wall and secure finger tight with the attaching parts. Raise the pump sufficiently to allow the pulley belts to be installed in the pulley grooves. Adjust the belts as outlined in b. Connect inlet and outlet piping to the proper ports of the pump, be sure drain plug is tight, add water to the pump for priming purposes, and then test for proper operation by starting the engine. If new belts were installed with the new pump, check for allowable deflection after approximately 50 hours of operation, as new belts will have a slight tendency to stretch as the newness wears off.

d. Belt Replacement. Replace a faulty pump assembly pulley belt as outlined in step c. Accomplish proper belt deflection as outlined in step b.

## 113. WATER TANK AIR CHECK VALVE

### a. Removal and Disassembly.

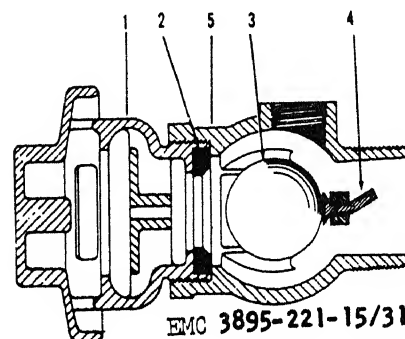
(1) See Figure 32. Unscrew the upper pipe nipple (3) from the pipe coupling (1) and the air check valve

assembly (8). Unscrew the air valve assembly from on top of the water tank (53).

(2) See Figure 31. If replacement of the valve body (5) is not required, removal and disassembly of all other valve components, except the body, is complete upon removing the valve cap (1) from the body, and then withdrawing the valve seat (2), and the check valve ball (3).

b. Inspection and Repair. Wash parts with an approved cleaning solvent. Inspect for damaged threaded areas, flat spots on the ball, or cracks in the body and cap. It is recommended to replace the rivet (4) whenever the valve assembly requires disassembly and cleaning procedures, being sure to bend the rivet shaft slightly to secure it in its mounting hole.

c. Reassembly and Installation. Carefully lower the ball (3) into the valve body, press the seat evenly into the cap (1), and then turn the cap down snugly onto the body. If the entire valve assembly was removed from the water tank, turn the valve into the tank top mounting hole so that body hole is in alignment with the pipe coupling of the water gage. Connect the valve to the pipe coupling with pipe nipple (3, Fig. 32). Fill water tank and observe for leakage at the pipe nipple connections and at the air valve assembly mounting hole.



- 1 Valve cap
- 2 Check valve seat
- 3 Check valve ball
- 4 Copper rivet
- 5 Valve body

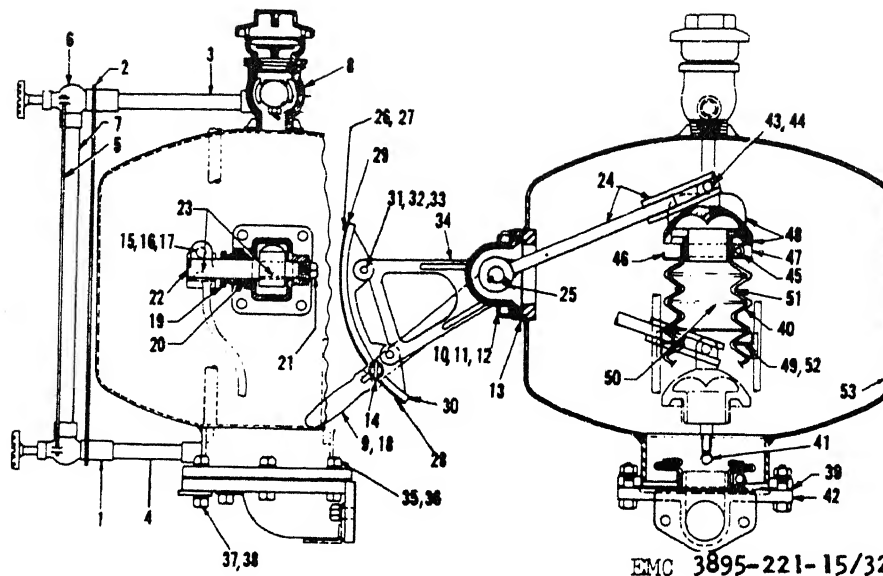
Figure 31. AIR CHECK VALVE ASSEMBLY.

## 114. WATER TANK

No adjustment of the water tank is required or possible. Incorrect amounts of water being discharged into the mixing drum is probably the result of a faulty freeway valve.

## 115. FREEWAY VALVE

Correct a leaking freeway valve by raising the control handle to its UP position, and turning down the two large nuts at the top of the valve stem two complete turns at a time until the leakage stops.



- |                             |                        |
|-----------------------------|------------------------|
| 1 Pipe coupling             | 28 Screw               |
| 2 Gage piping support       | 29 Measuring plate     |
| 3 Pipe nipple               | 30 Quadrant            |
| 4 Pipe nipple               | 31 Hex nut             |
| 5 Guard rod                 | 32 Cap screw           |
| 6 Water gauge cocks         | 33 Lock washer         |
| 7 Glass tube                | 34 Housing             |
| 8 Check valve assembly      | 35 Hex nut             |
| 9 Operating lever mechanism | 36 Cap screw           |
| 10 Hex nut                  | 37 Hex nut             |
| 11 Stud                     | 38 Cap screw           |
| 12 Copper washer            | 39 Elbow gasket        |
| 13 Lever gasket             | 40 Bellows assembly    |
| 14 Thumb screw              | 41 Pipe plug           |
| 15 Hex nut                  | 42 Outlet elbow        |
| 16 Machine bolt             | 43 Cotter pin          |
| 17 Lock washer              | 44 Lift fork pin       |
| 18 Operating lever          | 45 Hose clamp          |
| 19 Packing gland            | 46 Clamp insert keeper |
| 20 Gland packing            | 47 Clamp insert bar    |
| 21 Pipe plug                | 48 Spider              |
| 22 Operating shaft          | 49 Bellows guide       |
| 23 Woodruff key             | 50 Inner stiffner ring |
| 24 Bellows lift rod         | 51 Outer stiffner ring |
| 25 Set screw                | 52 Bellows             |
| 26 Machine screw            | 53 Water tank          |
| 27 Lock washer              |                        |

Figure 32. VERTICAL WATER TANK COMPONENTS.

## CHAPTER 4

### REPAIR AND OVERHAUL INSTRUCTIONS

#### Section 1. OVERHAUL AND REPLACEMENT STANDARDS

##### 116. GENERAL

The sections within this chapter provide overhaul and replacement standards, removal, complete disassembly, and overhaul or rebuilt instructions for the concrete mixer. These instructions are intended for echelons of maintenance having personnel with thorough mechanical knowledge and automotive tools at their disposal to accomplish the procedures contained herein. Refer to CHAPTER 3, OPERATOR MAINTENANCE, for coverage of assemblies

not included in this chapter since they do not require extensive knowledge or specialized tools.

##### 117. TABULATED DATA

a. Overhaul and Replacement Standards. Table III lists manufacturer's sizes, tolerances, clearances, and the maximum allowable wear and clearance for the components indicated.

Table III. ENGINE REPAIR AND REPLACEMENT STANDARDS

	Manufacturer's dimensions and tolerances in inches		Desired clearance		Maximum allowable wear and clearance
	Min.	Max.	Min.	Max.	
<b>Cylinders</b>					
Bore	3.251	3.252			0.003*
Out-of-round					0.002*
Taper					0.002*
<b>Main bearing bores, caps, and bearings</b>					
Bore	2.2495	2.2500			0.005*
Warpage, caps					
Inside main bearing bore at torque tightness	2.0589	2.0604			0.003*
Inside main bearing bore less liner at torque tightness	2.2495	2.2500			
Amount of bearing crush	0.0005	0.0015			
Amount removable from machined parting surfaces of caps and blocks					0.000
Cap	0.000	0.000			0.000
Block			0.0009	0.0034	0.0064*
Clearance of main bearing to crankshaft					
End play of crankshaft in bearings when installed	0.0948	0.0953	0.002	0.004	0.008*
Thickness of bearing liner					
<b>Face of Cylinder Head</b>					0.010*
Maximum allowable warpage					
<b>Crankshaft</b>					
Main bearing journals	2.057	2.058			0.006*
Main bearing allowable out-of-round		0.001			0.0025
Allowable runout of nearest center main journal when supported at each end		0.002			0.004*
Fillet radius	0.094	0.125			
Undersizes available from army supply					0.004*
Straighten if run-out is more than		0.002			
Runout of flywheel					
<b>Flywheel and ring gear</b>					
Nominal depth from surface of machined flanges for clutch	1-3/16	±0.005			
Permissible amount that can be moved from clutch face of flywheel		0.060			0.020*
Runout of ring gear					
Interference of id of ring gear to od of flywheel	0.018	0.026			
Wobble of flywheel machined surface for clutch (measuring from bell housing)		0.005			0.008*

Table III. ENGINE REPAIR AND REPLACEMENT STANDARDS

	Manufacturer's dimensions and tolerances in inches		Desired clearance		Maximum allowable wear and clearance
	Min.	Max.	Min.	Max.	
Housing face runout (assembly of engine) indicator mounted on flywheel		0.006			0.010*
Concentricity of flywheel to housing bore (assembly of engine) indicator mounted on flywheel		0.010			0.016*
Flywheel cover runout (at seal neck)					
<b>Piston</b>					
Diameter - Skirt	3.2495	3.2505			
Allowable wear from nominal diameter of skirt					0.006*
Piston pin diameter	0.8591	0.8593			0.0
Width of ring groove No. 1 tap	0.0960	0.0970			0.002*
No. 2 tap	0.0955	0.0965			0.002*
No. 3 tap	0.1880	0.1890			0.002*
Piston pin clearance					
Aluminum					
Cast Iron					
<b>Rings</b>					
Gap clearance (when fitted in cylinder)			0.007	0.015	0.040#
Clearance of ring in groove of piston Top	0.002	0.004			0.010*
2nd	0.0015	0.0035			0.008*
3rd	0.001	0.003			0.008*
<b>Connecting Rod</b>					
Maximum warpage of machined parting surfaces using straight edge and feeler					0.005*
Id liner, when installed in large (crankshaft) end	1.8114	1.8129			
Clearance connecting rod bearing- to-crankshaft			0.0005	0.003	0.007#
Side clearance of connecting rod bearing-to-crankshaft			0.005	0.010	0.020#
Maximum amount allowable removable from parting surface of rod	0.000	0.000			0.000
Maximum out-of-round horizontal	0.000	0.000			0.0015*
Diameter of small end without bushing	0.913	0.914			
Inside diameter of bushing (small end)	0.8592	0.8596			
Interference of bushing to id of rod	0.0025	0.0055			
Fit of piston pin to connecting rod bushing			0.0005	0.0012	0.005#
Allowable twist of connecting rod	0.000	0.0005			
<b>Connecting rod journals</b>					
Rod journals	1.8099	1.8109			0.003*
Allowable out-of-round		0.001			0.002*
Fillet radius	0.078	0.100			
<b>Valves</b>					
Stem diameter	0.3405	0.3415			0.002*
Stem to guide clearance			0.002	0.0025	0.006#
Angle of valve relief		60°			
Angle of valve seat		45°			
<b>Valve seats</b>					
OD of replacement exhaust valve seat units - Std. See Note 2	1.5035	1.50425			
Interference of od of insert to id of bore	0.0010	0.00375			
Width of valve seat	7/64	1/8			9/64*

Table III. ENGINE REPAIR AND REPLACEMENT STANDARDS

	Manufacturer's dimensions and tolerances in inches		Desired clearance		Maximum allowable wear and clearance
	Min.	Max.	Min.	Max.	
<u>Valve guides</u>					
Bore	0.3425	0.3435			0.002*
Interference of valve guide bushing to id of bore	0.001	0.0025			
<u>Tappet guide</u>					
Tappet guide bore	0.4995	0.5005			0.002*
Clearance, tappet to bushing			0.00075	0.001	0.002*
Interference of bushing to id bore	0.001	0.0025			
Diameter lifter	0.499	0.4995			
<u>Camshaft</u>					
Diameter of all journals	1.580	1.581			0.003*
Allowable runout of center journal, or nearest center, when end journals are supported		0.0010			0.003*
Dimensions of lobes from heel to toe		1.162			0.006*
Straighten if runout is more than	NO				
<u>Camshaft bushings and bearings</u>					
<u>Bearings</u>					
Clearance between camshaft journal and bushing			0.0015	0.0025	0.005#
Interference of bushing to id of case	0.0025	0.005			
End play of camshaft					
<u>Timing gears</u>			0.000	0.002	0.010#
Total backlash of camshaft gear					
Backlash of idler gear to crankshaft gear					
<u>Oil pump</u>					
Allowable wear on end plates before finding					0.006*
End play between gear and end plate					
Maximum allowable to surface grind from plate					0.032
Inside diameter drive end bushing	0.3745	0.3755			0.003*
Inside diameter non-drive end bushing	0.3745	0.3755			0.003*
Drive shaft diameter	0.3730	0.3735			0.003*
<u>Oil pump (cont'd.)</u>					
Driven shaft diameter	0.3705	0.371			0.003*
Clearance between gear to housing			0.0025	0.0045	0.008#
Backlash oil pump gear to camshaft			0.008	0.010	0.025#
Inside diameter idler shaft bushing	0.368	0.369			
<u>Relief valve</u>			0.002	0.006	0.003#
Clearance of valve in body					
<u>Water pump</u>					
Diameter of shaft - Bearing and shaft - one assembly					
Inside of bushing					
Clearance between impeller and pump body	0.010	0.020			0.035#
End play	0.00	0.00			0.004#
<u>Fan</u>					
Diameter of shaft (Mounted on water pump shaft)					
Inside diameter of bushing					0.025*
Runout of pulley					

NOTE: Replace or rework if worn (\*) more than, or if clearance (#) is greater than that shown in this column.  
 Note 2. No. oversize specified.

## Section II. GENERAL SERVICING AND REPAIR INSTRUCTIONS

### 118. BEARINGS

a. General. Proper maintenance is essential if maximum life and performance is to be obtained from bearings. Regular schedules for inspection and lubrication should be established and maintained. The frequency of the inspection and lubrication periods will depend on the type and design of the unit and the operating conditions. The manufacturer of the equipment usually specifies how often or when the inspection and lubrication changes should be made, and what type of lubricant should be used. The manufacturer works out these recommended practices with the bearing manufacturer and his recommendations should be followed. There are in general two types of equipment as far as maintenance is concerned. The first group includes gear drives, axle driving units, transmission of all types, and similar equipment. The maintenance is simple in these units as the bearings are sealed within the cases and lubricated. In these cases the bearings are inspected only when the unit is torn down for inspection, repair or replacement of some part, or when it is down for general overhaul. In the second group, it is necessary to remove the bearings fairly often. In some cases the grease and sometimes the seals should be renewed at regular intervals.

b. Removal and Installation. When disassembling a unit, the bearings should be removed and inspected one at a time. By using this procedure, determining factors may often be found, for failures. Usually a unit will have several bearings alike, so if this method is followed, a bearing failure can be found and its location determined which will help diagnose causes for failure of the parts.

(1) Pulling and Pressing. Care should be taken in removing bearings and cups so that bearings, shafts, and housings, are not damaged. This can best be done using a proper type of puller or press. Hot oil or steam heat can sometimes be used along with pullers or wedges to get bearings off the shafts. When the puller has been put on and pressure applied, steam or hot oil in the bearing will cause it to expand and if pressure is applied before heat gets to the shaft, the bearing will come off readily.

**CAUTION:** When using steam for this purpose, the bearings must be immediately washed, cleaned, thoroughly dried, and lubricated to guard against corrosion.

(2) Driving. When it is necessary to drive out cups or drive off bearings or cones extreme care should be exercised in preventing damage to parts, such as cups, cones, inner and outer races, or distorting the surface of bearings when reassembled. The use of drifts should be avoided, unless absolutely necessary. If it is necessary to use a drift for starting or straightening the bearing on the shaft, the drift should be made of cold rolled steel, not aluminum or brass, which will tend to chip off and damage bearings.

c. Inspection and Repair. After bearings are removed, they should be thoroughly cleaned, dried, and inspected. If they are in good condition and are to be used again, they should be dipped in oil or covered with soft grease to prevent rusting. If bearings are not replaced

immediately after removal, they should be wrapped in oiled paper and boxed to keep them dry and clean. If there is ever any doubt as to whether bearings are serviceable, and whether they should be reused, it is always better to install new bearings than to take a chance on premature bearing failure on an old bearing.

### 119. OIL SEALS

a. Removal. Oil seals, if functioning properly, retain lubricants and exclude harmful abrasives in preventing dirt from entering. In removing oil seals care must be exercised to prevent damage. However, in most cases, it is always better to install new seals than to replace used seals.

b. Inspection. If leather or synthetic lip is damaged or worn in any way, install new seals.

c. Installation. Soak seals in light oil before installing. Oil seals should be carefully installed with lips turned in such a direction as will prevent the lubricant from leaking to the outside of the gear case or transmission housing. When installing seals, care should be exercised to prevent cutting the leather with splines, keyways, or sharp edges of the shaft.

### 120. GEARS AND SPROCKETS

a. Removal and Installation. Never heat a gear to remove it from a shaft, unless it is absolutely necessary. Care should be taken not to get the gear too hot. Use a gear puller whenever possible. Most gears are heat treated and flame hardened and the heat treatment may be destroyed if the gear is heated. When applying keyed gears to a shaft, wherever possible, the gear or sprocket, should first be positioned, then the key installed. Care must be exercised to properly align keyways.

b. Inspection and Repair. After gears or sprockets are removed, they should be thoroughly cleaned, dried and inspected. If they are in good condition and are to be used again, they should be dipped in oil or covered with soft grease to prevent rusting. In the case of sprockets, if new chain is to be installed, never run it over sprockets with worn or hooked teeth. Also, never run badly worn chain on new sprockets. Sprockets, if not too badly worn, can, in some cases, be reversed on the shaft and the opposite surfaces of the teeth used.

### 121. BUSHINGS

a. Removal and Installation. When disassembling a unit the bushings should be removed with a puller or press whenever possible. This should be carefully done so as to not damage the bushings. When installing bushings, use a press or drive them in carefully so as to not batter or distort the edges. Bushings should always fit tight in the housing so there is no chance of their turning with the shaft. Be sure they are free of burrs and scratches.

b. Cleaning and Inspection. Clean bushings carefully and inspect for condition. As in the case of general overhaul it is advisable to replace bushings.



## Section III. ENGINE OVERHAUL

### 122. ENGINE

#### a. Removal (Fig. 3)

(1) Close shutoff cock (24), disconnect fuel line (15), and disconnect fuel level gage (25) and battery indicator gage (26) wires at their instruments.

(2) Remove the mixer water pump pulley drive belts as outlined in paragraph 112.

(3) Disconnect battery to engine cables.

(4) Raise the countershaft housing (7, Fig. 2) cover, and remove the attaching parts that secures the power-take-off stub shaft (85, Fig. 53) to the engine fly-wheel.

(5) Remove the attaching parts that secures the engine to its mounting locations on the mixer. Carefully attach a sling from an overhead crane around the engine, take up the sling slack, and lift the engine up and away from the mixer.

b. Installation. Install in reverse order of removal, step a.

### 123. CYLINDER HEAD

#### a. Removal (Fig. 33).

(1) Remove thermostat housing and water outlet (par. 73).

(2) Remove the temperature bulb from the well in the side of the head.

(3) Remove the spark plugs (par. 65).

(4) Remove muffler (par. 87).

(5) Loosen and remove cylinder head bolts (1) and washers (2); lift off the cylinder head (3) and gasket (4). Tap head lightly with a soft hammer if necessary, but do not pry on the contact surface.

#### b. Cleaning, Inspection, and Repair.

(1) Carefully scrape and wire brush all carbon deposits from the cylinder head, cylinder block, and from the top of the pistons. Turn the crankshaft until two of the pistons are on top-dead-center, clean off the carbon, and turn the crankshaft until the other two pistons can be cleaned; repeat until all pistons are cleaned. Make sure that all loose carbon is removed to prevent it from getting into the water passages and engine oil.

(2) Inspect cylinder head thoroughly for cracks; if cracked, replace head.

(3) Check head for trueness of surface. Place straightedge lengthwise on the machined surface, and with a feeler gage measure at the center the amount of bow or warp in the head. If the cylinder head is bowed or warped in excess of 0.010 inch, the cylinder head should be replaced. Next, place the straightedge crosswise on

the machined surface of the head, and measure with feeler gage at the center of the head. If the head is crowned in excess of 0.006 inch, it should be replaced.

#### c. Installation (Fig. 33).

(1) Install the new head gasket (4) to the block (29).

(2) Install the cylinder head (3) and secure the bolts (1) and washers (2). Tighten to 40-45 ft. lb. (foot pounds).

(3) Install the thermostat housing and water outlet.

(4) Install temperature bulb in the well in the side of the head.

(5) Install spark plugs.

(6) Install the muffler if it was removed.

(7) Fill the cooling system.

### 124. OIL PAN

#### a. Removal and Disassembly (Fig. 34).

(1) Remove drain plug (7) and drain the oil.

(2) Remove bayonet gage.

(3) Remove starter if necessary.

(4) Remove the five screws (8) and lock washers (9) that hold the oil pan (4) to the bell housing.

(5) Remove 16 cap screws (6) and lock washers (5) that hold the pan to the engine block, and lower the pan and gaskets (1).

(6) Remove six cap screws (2) and lock washers (3), and lift out the baffle plate and strainer assembly (10).

#### b. Cleaning, Inspection, and Repair.

(1) Clean the entire assembly with cleaning solvent; blow out the screen sump and use a wire brush to clean out heavy sludge.

(2) Check the oil pan for breaks which might result in leakage, and knock out any minor dents.

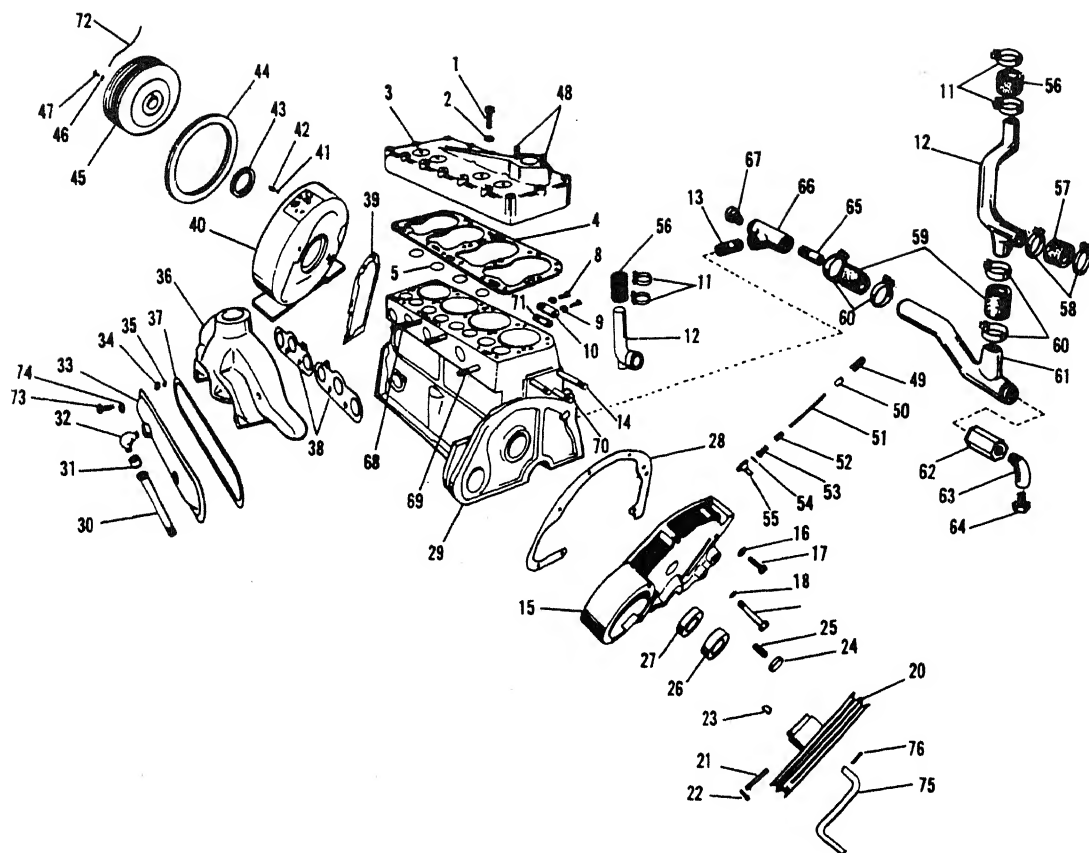
(3) If the sump screen is damaged beyond repair; replace the baffle plate and strainer assembly.

#### c. Reassembly and Installation.

(1) Install the baffle plate and strainer assembly (10) in the oil pan, and secure with six cap screws (2) and lock washers (3).

(2) Install the new gasket (1) to the oil pan (4).

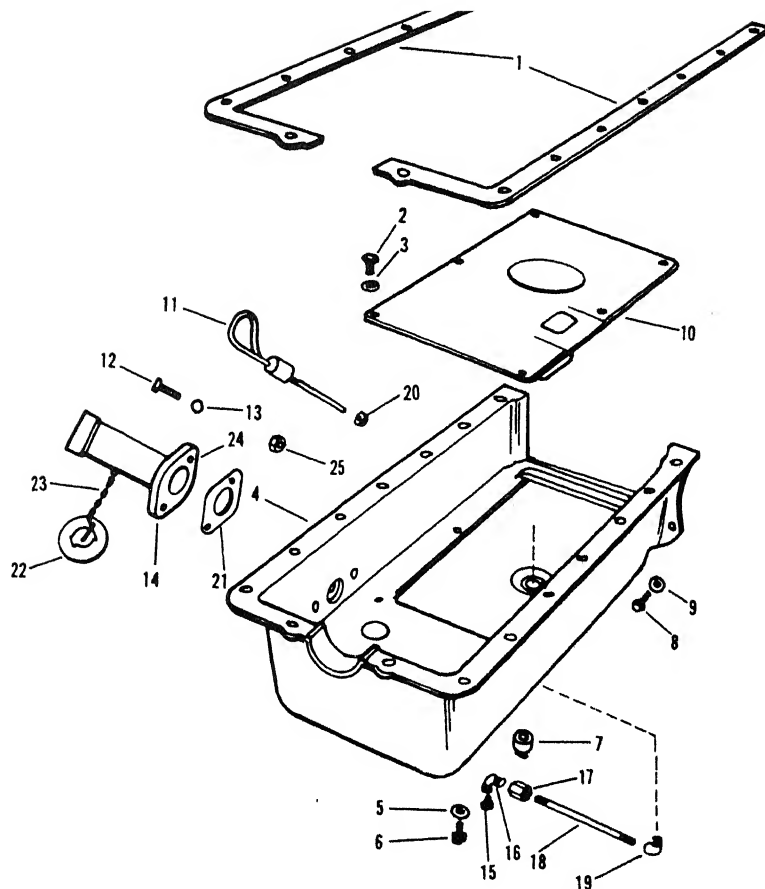
(3) Move the oil pan into place and start cap screws (6) and lock washers (5) in each corner of the pan; then start the twelve others.



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- |                      |                         |                        |
|----------------------|-------------------------|------------------------|
| 1 Bolt               | 27 Rubber sleeve        | 52 Bushing             |
| 2 Washer             | 28 Gasket               | 53 Helical gear        |
| 3 Cylinder head      | 29 Engine block         | 54 Drive gear spacer   |
| 4 Gasket             | 30 Crankcase vent       | 55 Helical gear        |
| 5 Valve insert       | 31 Nut                  | 56 Rubber hose         |
| 6 Plain stud         | 32 Crankcase vent       | 57 Rubber hose         |
| 7 Plain stud         | 33 Valve cover assembly | 58 Hose clamp          |
| 8 Machine bolt       | 34 Plain nut            | 59 Rubber hose         |
| 9 Lock washer        | 35 Collar               | 60 Hose clamp          |
| 10 Oil cover plate   | 36 Manifold             | 61 Drain tube          |
| 11 Hose clamp        | 37 Gasket               | 62 Tube union          |
| 12 Lower tube        | 38 Gasket assembly      | 63 Street elbow        |
| 13 Nipple            | 39 Gasket               | 64 Pipe plug           |
| 14 Plain stud        | 40 Bellhousing          | 65 Nipple              |
| 15 Gear cover        | 41 Lock washer          | 66 Tee                 |
| 16 Lock washer       | 42 Machine bolt         | 67 Pipe plug           |
| 17 Cap screw         | 43 Plain seal           | 68 Stud                |
| 18 Lock washer       | 44 Ring gear            | 69 Stud                |
| 19 Bolt              | 45 Flywheel             | 70 Stud                |
| 20 Crankshaft pulley | 46 Lock washer          | 71 Plate gasket        |
| 21 Pulley pin        | 47 Machine bolt         | 72 Lock wire           |
| 22 Cotter pin        | 48 Attaching stud       | 73 Cover screw         |
| 23 Key               | 49 Tachometer drive     | 74 Screw gasket        |
| 24 Plain nut         | 50 Bushing              | 75 Starting hand crank |
| 25 Adjusting screw   | 51 Tachometer shaft     | 76 Crank pin           |
| 26 Plain seal        |                         |                        |

Figure 33. ENGINE CRANKCASE AND HEAD.



- 1 Cork gasket
- 2 Cap screw
- 3 Lock washer
- 4 Oil pan
- 5 Lock washer
- 6 Cap screw
- 7 Pipe plug
- 8 Machine screw
- 9 Lock washer
- 10 Oil pan strainer
- 11 Bayonet gage assembly
- 12 Attaching stud
- 13 Lock washer
- 14 Oil filler pipe
- 15 Drain plug
- 16 Street elbow
- 17 Coupling
- 18 Nipple
- 19 Street elbow
- 20 Bayonet gage gasket
- 21 Filler pipe gasket
- 22 Cap
- 23 Cap chain
- 24 Flange
- 25 Nut

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Figure 34. OIL PAN AND GASKETS.

(4) Install five screws (8) and lock washers (9) securing the oil pan to the bell housing. Tighten all cap screws to secure the oil pan.

(5) Install the starter if it was removed.

(6) Install the bayonet gage.

(7) Install drain plug (7) and service the crankcase.

## 125. OIL PUMP

### a. Removal.

(1) Remove oil pan (par. 124).

(2) Remove the two cap screws which secure the oil pump into the engine and lift out the pump and its gasket.

### b. Disassembly (Fig. 35).

(1) Remove four screws (7) to remove the cover (8).

(2) Remove pin (14) from the drive gear (1) and remove drive gear thrust washer (3), and woodruff key (2) from the drive shaft (11).

(3) Remove the drive shaft with assembled pump gear from the body (4).

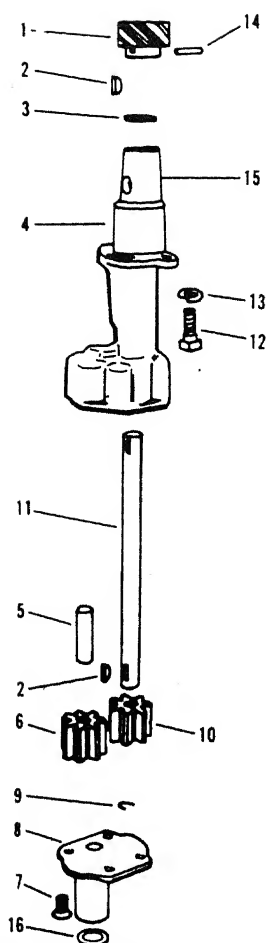
(4) Press the pump gear (10) down on the shaft about 3/8 inch to remove the snap ring (9). Then press shaft out of gear and remove woodruff key (2).

(5) Remove the idler gear (6) and press idler shaft (5) out of the body.

### c. Inspection and Repair.

(1) Check drive shaft for wear and damage; replace if necessary.

(2) Inspect condition of all gears and keys. Use a fine file to remove small burrs or other minor damage; otherwise, replace gears and keys.



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- |                  |                    |
|------------------|--------------------|
| 1 Oil drive gear | 10 Pump gear       |
| 2 Woodruff key   | 11 Drive shaft     |
| 3 Drive washer   | 12 Machine bolt    |
| 4 Oil pump body  | 13 Lock washer     |
| 5 Idler shaft    | 14 Gear drive pin  |
| 6 Idler gear     | 15 Mounting gasket |
| 7 Machine screw  | 16 Felt washer     |
| 8 Oil pump cover |                    |
| 9 Oil snap ring  |                    |

Figure 35. ENGINE OIL PUMP

(3) If cover is worn as indicated by circular grooves, place it.

d. Reassembly (Fig. 35).

(1) Press idler shaft (5) into pump body (4), and stall idler gear (6) on the shaft.

(2) Insert woodruff key (2), and press pump gear (10) on the drive shaft (11) to enable installation of the ap ring (9); then press gear back so that the ring seats in a gear.

(3) Insert the drive shaft with assembled pump gear into the body. Then install thrust washer (3), woodruff key (2), and drive gear (1) on the shaft, and secure with pin (14).

(4) Rotate the drive shaft and check for tight places. Check the thrust at the thrust washer. If thrust is not between 0.0015 inch and 0.003 inch, replace with thinner or thicker thrust washer accordingly. Then peen over ends of pin.

(5) Install cover (8) in place and secure with four screws (7).

e. Installation.

(1) Secure oil pump in engine with two cap screws and washers, and using a new mounting gasket.

(2) Install oil pan and service crankcase.

(3) Start engine and adjust oil pressure between 15 to 25 pounds.

126. VALVES

a. Removal (Fig. 35).

(1) Remove spark plugs and cables.

(2) Remove cylinder head.

(3) Remove manifold.

(4) Remove two bolts, washers, and ignition cable bracket, and remove valve cover and gasket.

(5) Wad a piece of cloth over the holes in the valve chamber to prevent the valve keys from dropping in the crankcase.

(6) With a valve lifter inserted between the valve tappet boss and valve spring seat, raise the spring on those valves which are in closed position and remove the spring retainer keys. Turn crankshaft with crank until those valves which are open become closed, and repeat the above operation.

(7) Remove valves and place them in a valve rack so they can be identified with the cylinders from which they were removed.

(8) Set the end of a screwdriver under the valve spring seat (4) and force up the spring (3) and seat, and "flick" outward to remove the valve spring seat, valve spring, and valve cap (6).

b. Cleaning and Inspection.

(1) Valves.

(a) Use a wire brush or buffing wheel to remove all carbon from the valve face, head, and stem. Polish valve stems lightly with an extremely fine abrasive cloth.

(b) Check to see that the grooves in the stem where the spring retainer keys fit have not lost their shoulders

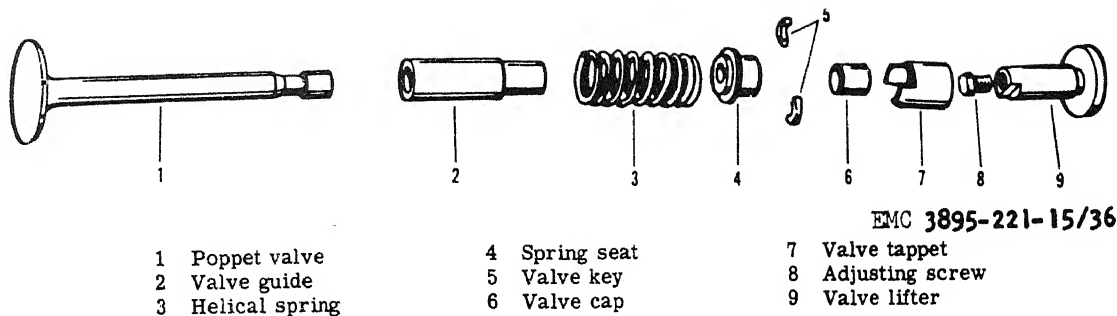


Figure 36. ENGINE VALVE.

through wear. Also inspect each valve for burned or cracked heads. Warped, burned, or cracked valves must be discarded. Valves which are not badly damaged can be reconditioned.

(c) Check the diameter of the valve stem; if excessively worn, replace.

(2) Seats and Guides.

(a) Clean the face of the valve seats thoroughly; if cracked or excessively grooved, report to the proper authority.

(b) Check the angle of the seat. If it exceeds 30° or shows signs of pitting, regrind.

(c) Clean the valve guide on the inside with a rifle bore wire brush. Rotate the brush to remove all gum deposits in the valve guide.

(d) Check the wear of each valve guide by inserting a new valve in it and feeling the clearance by moving the valve stem back and forth. If the clearance is excessive, report to the proper authority.

(3) Valve Springs.

(a) Clean valve springs with cleaning solvent. Examine for rust and pitting, and check for broken or set coils. Replace if necessary.

(b) Check the spring tension on a scale. Reading should be 19 to 23 pounds at 1-7/16 inch, which is the minimum working height. Any springs which are distorted or do not fall within these specifications should be replaced with new springs.

c. Installation (Fig. 36).

(1) Place the spring seat (4) and spring (3) in position in the valve compartment.

(2) Place a little oil on the valve stems and install each valve in its proper port.

(3) Use a valve spring compressor to raise the valve springs sufficiently on those valves which are in closed position, and install the valve caps (6) and valve keys (5).

(4) Turn the engine over and repeat the procedure until all valve springs are locked on the valve stems.

(5) Remove wads of cloth used to prevent parts from dropping through holes in the crankcase.

(6) Adjust the valve clearance.

(7) Install cylinder head.

(8) Position the gasket and valve cover with ignition cable bracket held in place, and secure to the block with two washers and bolts.

(9) Install manifold.

(10) Install spark plugs and cables.

d. Adjustment.

(1) Start the engine and run to operating temperature.

(2) Set engine at a fast idling speed.

(3) Adjust valve clearance by turning adjusting screw (8) clockwise to increase valve clearance and counter-clockwise to decrease valve clearance. Use a feeler gage and set the exhaust valves at 0.008 inch and the intake valves at 0.006 inch.

(4) Reset engine to normal idling speed.

127. FLYWHEEL

a. Removal (Fig. 33).

(1) Remove the lockwire which secures the bolts (47).

(2) Remove the four bolts (47) holding the flywheel (45) to the crankshaft.

(3) Slide the flywheel off the dowel pins and remove it.

b. Disassembly.

(1) Drive the ring gear (44) off the flywheel with

a hammer and square-nosed punch.

(2) Use a drift pin to tap the two dowel plugs from the flywheel.

c. Cleaning and Inspection.

(1) Clean the entire assembly thoroughly with cleaning solvent.

(2) Inspect the flywheel thoroughly for cracks. Check the flywheel in a lathe if surface contacted by clutch is warped or scored. Refinish the surface to make it smooth and flat for greatest efficiency of clutch operation.

(3) Inspect the ring gear carefully for damaged or broken teeth.

d. Reassembly and Installation (Fig. 33).

(1) Heat a new ring gear (44) sufficiently to expand it so it can slip over the flywheel (45).

(2) Place the gear in position on the flywheel with the chamfered ends of teeth of ring gear facing toward the engine block. Tap the ring gear down tight against the shoulder on the flywheel and permit it to cool.

(3) Position the flywheel on the two dowel pins and secure with four bolts (47). Draw the bolts up uniformly and tighten securely.

(4) Attach indicator to check concentricity of the pilot bore. It should not exceed 0.010 inch.

(5) Place indicator in position to check square of flywheel face. It should not exceed 0.010 inch.

(6) Lock each pair of bolts together with lockwire threaded through bolt heads and install dowel plugs.

## 128. BELL HOUSING

a. Removal (Fig. 33).

(1) Place suitable supports under the rear of oil pan to support engine. Block must be large enough so that oil pan is not damaged. Do not use jack unless large block is placed between jack screw and oil pan.

(2) Remove flywheel (par. 127).

(3) Remove any assemblies attached to the outside of the bell housing.

(4) Remove five cap screws and lock washers which secure the oil pan to the housing.

(5) Remove two bolts (42) and lock washers (41) which secure the bell housing to the engine block.

(6) Remove the bell housing (40) and gasket (39).

(7) Drive out the oil seal (43) from the bell housing.

b. Cleaning and Inspection.

(1) Clean the entire assembly with a wire brush, and inspect for cracks or other signs of strain.

(2) Inspect thread holes for general condition and repair if necessary.

(3) Use new gasket and seal for reassembly.

c. Reassembly and Installation.

(1) Install the oil seal (43) flush with the inner face of the housing (40). The lip should be facing the engine block.

(2) Position a new gasket (39) in place using grease to insure a tight seal and to enable easy installation.

(3) Attach the bell housing to the engine block by installing two bolts (42) and lock washers (41) from inside of the bell housing.

(4) Install the five bolts and lock washers which secure the oil pan to the bell housing.

(5) With dial indicator, check the concentricity of the bell housing bore with the crankshaft. It should be within 0.010 inch. The bell housing may be shifted slightly on the screws if necessary.

(6) When the bell housing is properly centered, tighten the attaching cap screws securely. Recheck after tightening, as housing may have moved during this operation.

(7) Set the indicator and check the square of the bell housing face. This should not exceed 0.006 inch.

(8) Install the flywheel.

(9) Install any assemblies which are attached to the outside of the bell housing.

(10) Remove blocking from beneath engine if it was used.

**CAUTION:** Use care in the installation of the bell housing oil seal. Do not distort seal by excessive hammering. Do not attempt to install seal by hammering on only one side. Be careful not to peen or bend edges of seal.

## 129. FRONT GEAR COVER AND PULLEY

a. Removal (Fig. 33).

(1) Remove the two cotter pins (22) and drive out the pin (21). Then remove the crankshaft pulley (20) with a jaw type puller, and lift off the woodruff key (23).

(2) Place suitable supports under the front of the oil pan to support the engine. Place a block between the jack and oil pan so that the oil pan is not damaged.

(3) Remove the four engine support bolts (19) and

lock washers (18) and remove the front motor supports and the front mounting bracket.

(4) Remove the four cap screws and lock washers securing the oil pan to the front gear cover (15).

(5) Remove the four cap screws (17) and lock washers (16) securing the front gear cover to the engine block (29).

(6) Pull the gear cover and gasket (28) forward away from the engine. The oil seal (26) and sleeve (27) will pull off the crankshaft with the front gear cover.

(7) Remove the oil seal and sleeve from the cover.

(8) Loosen the locknut (24) and remove the camshaft adjusting screw (25) from the front gear cover.

#### b. Cleaning and Repair.

(1) Use a wire brush to thoroughly clean the front gear cover and inspect it for cracks. If cracked, replace.

(2) Inspect the crankshaft pulley for cracks or damaged sheaves; use a fine file to remove minor burrs and rough spots.

(3) Check the camshaft adjusting screw to see if the wearing plug housed in it appears to be excessively worn; replace where necessary.

(4) Use new oil seal, rubber sleeve, and gasket in reassembling.

#### c. Installation (Fig. 33).

(1) Slip the rubber sleeve (27) over the oil seal (26) and install in the groove provided in the front gear cover (15).

(2) Cement the gasket (28) to the gear cover and slide the gear cover back in place.

NOTE: Because of tight clearance it is advisable to loosen the front of the oil pan and slightly drop the pan to avoid difficulty and danger to the oil seal and sleeve when pushing the gear cover back into place.

(3) Install four cap screws (17) and lock washers (16) securing the front gear cover to the engine block (29); do not tighten.

(4) Install four cap screws and lock washers securing the oil pan to the front gear cover; do not tighten.

(5) Check to see that the oil seal and sleeve are properly seated in the oil pan and front gear cover.

(6) Tighten all gear cover and oil pan cap screws.

(7) Place the generator front mounting bracket and motor support in place, and install four mounting bolts (19) and lock washers (18).

(8) Set the woodruff key (23) in the slot in the

crankshaft, and install the crankshaft pulley (20).

(9) Align the hole in the crankshaft pulley with the hole in the crankshaft, and insert the pin (21). Secure the pin with two cotter pins (22).

(10) Install the camshaft adjusting screw (25) in the front gear cover and turn in until it contacts the camshaft; turn the screw out approximately one-eighth and tighten locknut (24).

### 130. PISTONS AND CONNECTING RODS

#### a. Removal (Fig. 37).

(1) Remove the cylinder head.

(2) Remove the oil pan.

(3) Check for ridges at the top of cylinder bores and remove if present, before attempting to remove pistons.

(4) Turn the crankshaft over so that number one and number four rods are in the lower position. Remove cotter pins (12) and nuts (11) from bolts (14) on both rods (8); tap bearing caps (10) lightly on bolt boss to loosen and remove.

(5) Remove piston and rod assembly by pushing the piston and rod up through the cylinder, being careful not to scratch or nick the cylinder with the rod being pushed through.

(6) Reassemble the connecting rod bearing caps to proper rods to avoid mixup.

(7) Turn the crankshaft over so that number two and number three rods are in the lower position. Then follow the procedure outlined in steps (3) and (4) above to remove pistons.

#### b. Disassembly (Fig. 37).

(1) Remove rings (1, 2, and 3) in that order from the piston with a ring expanding tool.

(2) Remove the lock ring (6) from each end of the piston pin (5) and drive out the pin.

(3) Drive out the bushing (7) from the connecting rod, being careful not to damage the inside bore of the rod end.

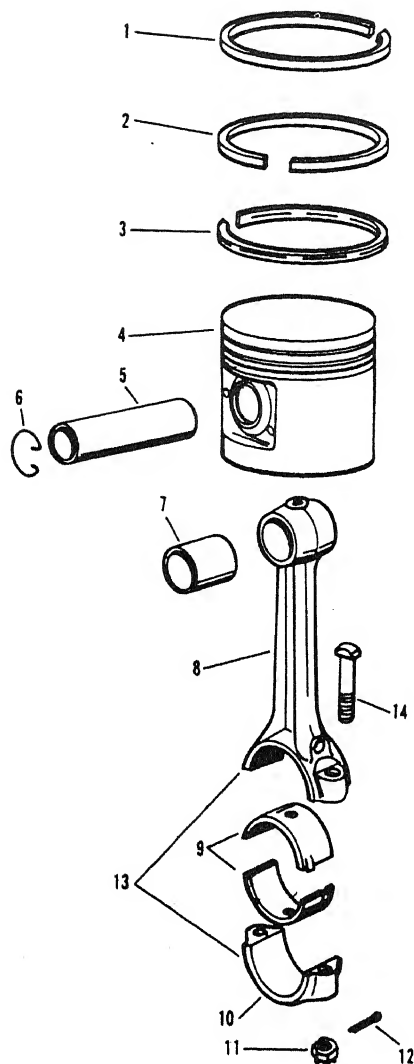
#### c. Cleaning.

(1) Follow the cleaning instructions of paragraph 123 b.

(2) Remove all carbon from the ring grooves in the pistons and the top of the pistons with a wire brush; make sure the oil holes in the lower groove are open.

(3) Wash all the parts in cleaning solvent; dry thoroughly.

#### d. Repair (Fig. 37).



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- 1 Top ring
- 2 Center ring
- 3 Oil ring and expander
- 4 Piston
- 5 Pin
- 6 Lock ring
- 7 Bushing
- 8 Connecting rod
- 9 Bearing
- 10 Bearing cap
- 11 Slotted nut
- 12 Cotter pin
- 13 Rod assembly
- 14 Machine bolt

Figure 37. PISTONS AND CONNECTING RODS.

(1) When overhauling an engine use new bushings (7) and piston pins (5).

(2) Check the diameter of the pin to see if it is excessively worn. Replace if necessary.

(3) Use a new piston pin to check the wear of the bushing in the connecting rod end; if the pin is loose, replace the bushing.

(4) If in step (2) above, the piston pin holes were found to be excessively worn, ream the holes and bush to the next available piston pin oversize.

(5) All rod bearings are replaced with new ones at every major overhaul.

(6) Measure each connecting rod journal for wear and out-of-round. If out-of-round is more than 0.015 inch, grind journals.

(7) If rod journals are not out-of-round more than 0.015 inch, but are worn, substitute available undersized bearing inserts. The amount of undersize will correspond to the amount of wear on the journal. Each undersized bearing insert is so machined to provide sufficient oil clearance.

(8) Check for damaged or twisted rods. Realign slightly twisted connecting rods; replace if badly twisted or otherwise damaged.

#### e. Reassembly (Fig. 37).

(1) Install rings (3, 2, and 1) in that order on the pistons with the ring expanding tool. Check tags to see rings are on the right piston.

**CAUTION:** The top ring is the taper-faced type and must be assembled with the word TOP on the upper side.

(2) After installing the rings, stagger the ring gaps around the piston.

(3) If the bushing (7) was removed in disassembly, install the new bushing in the connecting rod and center the end between the piston bosses in line with the piston pin holes. Apply a little oil to the piston pin (5) and tap it into place; secure it with two lock rings (6).

**NOTE:** The arrow on top of the piston (4) is an assembly mark. When looking at the assembly numbers stamped on the connecting rod, the arrow on the piston must point to the right for proper assembly of the rod to the piston.

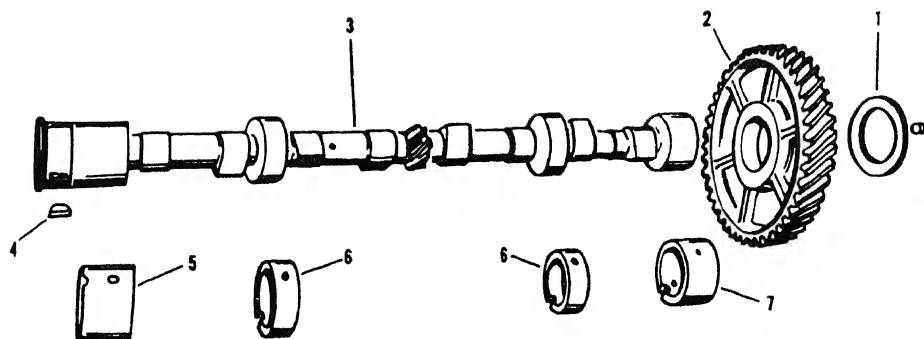
(4) If undersized bearing inserts are being used, be sure they are set in the proper rods and caps.

#### f. Installation.

(1) Turn the crankshaft over so that numbers one and four crankshaft connecting rod journals are in the lower position.

(2) Apply a little oil to the pistons and ring. Compress the rings on No. 1 piston and insert the piston





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- |   |               |   |                         |
|---|---------------|---|-------------------------|
| 1 | Thrust washer | 5 | Front camshaft bearing  |
| 2 | Camshaft gear | 6 | Center camshaft bearing |
| 3 | Camshaft      | 7 | Rear camshaft bearing   |
| 4 | Woodruff key  | 8 | Pipe plug               |

Figure 38. CAMSHAFT AND TAPPET.

in No. 1 cylinder bore with the connecting rod assembly mark facing the camshaft side.

(3) Use a wooden handle to push the piston down into the bore and at the same time guide the rod over the connecting rod journal.

(4) Insert the rod bolts (14) in place being sure they are properly seated. After oiling the inserts, install the lower insert and bearing cap with the assembly number on the camshaft side, and secure with the two nuts (11).

(5) Tighten nuts to 42 ft-lb torque. The clearance is correct when the rod can be moved from side to side without forcing and yet create a slight drag on the crankshaft.

NOTE: After checking each rod bearing for fit, slightly loosen the nuts so that each journal is checked separately, unaffected by the drag created by the others.

(6) Follow the same procedure outlined above and install piston No. 4.

(7) Turn the crankshaft over so that numbers 2 and 3 connecting rod journals are in the lower position to install pistons 2 and 3 as outlined above.

(8) Tighten all the nuts to 42 ft-lb torque and secure with cotter pins (12).

(9) Install the oil pan.

(10) Install the cylinder head.

### 131. CAMSHAFT AND TAPPET

#### a. Removal (Fig. 38).

(1) Remove the oil pan.

(2) Remove the oil pump.

(3) Remove the valves.

NOTE: If necessary, remove the camshaft without removing the valves. This can be done by using a valve lifter to raise up the valve springs and blocking up the valve tappets with 1-1/16 inch-long nails.

(4) Remove the front gear cover.

(5) Pull the camshaft forward out of the engine. It may be necessary to turn the camshaft slightly to permit the bearing journals to pass the crank throws.

(6) Press the camshaft gear (2) off the camshaft (3) and remove the camshaft gear, thrust washer (1), and woodruff key (4).

(7) Remove the tappets from the cylinder block; remove the adjusting screws from the tappet.

(8) Drive out the front camshaft bearing (5), center camshaft bearing (6), and the rear camshaft bearing (7) with a camshaft bearing driver.

(9) If the tappets appeared loose in the tappet guide, drive the tappet guide out from the cylinder block.

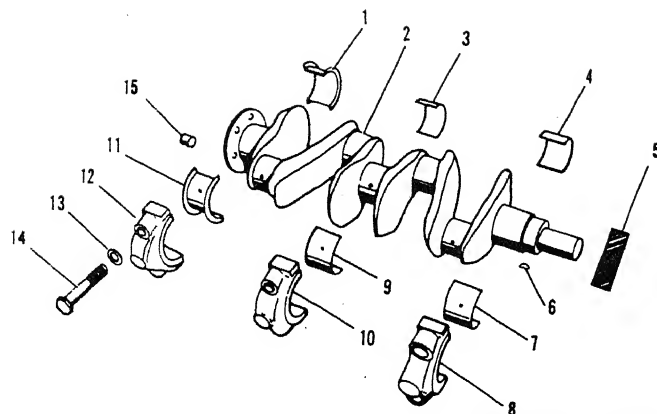
#### b. Cleaning, Inspection, and Repair.

(1) Wash all parts in cleaning solvent thoroughly. Clean the camshaft oil holes with a wire brush.

(2) Check the general condition of the camshaft for roughness or other signs of damage to the lobes and journals.

(3) Check the gear machined integrally to the camshaft for chipped or broken teeth, and if any appear damaged, replace the camshaft.

(4) Place the camshaft in V-blocks and check



- 1 Main bearing insert, upper
- 2 Crankshaft
- 3 Main bearing insert, upper
- 4 Main bearing insert, upper
- 5 Gear
- 6 Woodruff key
- 7 Main bearing insert, lower
- 8 Bearing cap
- 9 Main bearing insert, lower
- 10 Bearing cap
- 11 Main bearing insert, lower
- 12 Bearing cap
- 13 Lock washer
- 14 Machine bolt
- 15 Flywheel dowel

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Figure 39. CRANKSHAFT AND MAIN BUSHINGS

the run-out of the journals. If the camshaft is not excessively out of line straighten it in an arbor press.

(5) Measure each of the journals for wear. If the journals are excessively worn the camshaft must be replaced.

(6) Check the camshaft gear for broken or damaged teeth, and replace if necessary.

(7) Replace the thrust washer if it is grooved or worn.

(8) Examine the valve tappet faces, and replace if they are found to be scored or cracked. Use a fine file to remove minor rough spots.

(9) Check the clearance between the tappet and tappet guide; replace the guide if necessary.

(10) Check the threads on the adjusting screw. If the screw turns too easily in the tappet body, replace screw.

#### c. Installation (Fig. 38).

(1) Drive the new bearings (5, 6 and 7) into place with a camshaft bearing driver. Be sure to line up the oil holes in the bushings with the rifle-drilled holes in the engine block.

(2) Drive the new tappet guides into place if any were removed on disassembly.

Install the adjusting screws into the valve and insert the assembly into the engine block.

(4) in place and press in the camshaft (3). It will slide and camshaft will not to damage the

the camshaft gear and

(6) Install the front gear cover.

(7) Install the oil pump.

(8) Service with oil.

(9) Install and adjust the valves.

#### 132. CRANKSHAFT AND MAIN BUSHINGS

##### a. Removal (Fig. 39).

(1) Remove the oil pan.

(2) Remove the oil pump.

(3) Remove the front gear cover.

(4) Remove the flywheel.

(5) Remove the connecting rod bearing caps.

(6) Remove the bolts (14) and lockwashers (13), and remove the main bearing caps (8, 10, and 12) with the lower bearing inserts (7, 9, 11) in place.

(7) Lift the crankshaft (2) out of the block and remove the upper bearing inserts (1, 3, and 4).

(8) Use a puller and remove the crankshaft gear (5) from the crankshaft; remove the woodruff key (6).

(9) Remove the dowel pins (15) if they are loose or otherwise damaged.

##### b. Cleaning, Inspection, and Repair.

(1) Wash all the parts in cleaning solvent and dry thoroughly.

(2) Remove the two oil plugs from the front and back of the engine block and clean out the rifle-drilled holes with a wire brush and clean out the rifle-drilled

holes in the crankshaft; blow out with compressed air. Install the two oil plugs which were removed and tighten securely.

(3) Check the general condition of the crankshaft for roughness, scoring, or other damage.

(4) Mount the crankshaft in V-blocks and check the runout at the center main bearing journal. If not excessively out of line, straighten it in a press; otherwise, replace it.

(5) Measure the main bearing journals for out-of-round and general wear. If either is excessive, regrind the crankshaft. Regrind the main bearing journals to the smallest undersize that will clear up wear of out-of-round condition.

(6) Check connecting rod journals and bearings. If connecting rod journals must be reground, follow the procedure outlined in step (5) above.

(7) Check the flywheel bolt holes for cracks or other damage.

(8) Check the crankshaft gear for broken or damaged teeth; replace if necessary. Mark the new gear in exactly the same spot as the old gear. Do this by placing the new gear on top of the old gear and linking both the keyways, and then placing a punch mark at the proper spots.

(9) Check the bearing caps for cracks or other damage; use a fine file to remove small burrs and to correct other minor damage. Do not attempt to file ends, for they are machined to fit the engine block.

#### c. Installation (Fig. 39)

(1) Slide the top half of the main bearing inserts (1, 3, and 4) in place and lightly lubricate.

NOTE: Unlike the connecting rod bearing inserts, the main bearing inserts, top and bottom halves, are not interchangeable. The top half has two holes, one of which must line up with the vertically drilled holes in the engine block through which oil is pumped to the crankshaft journals.

(2) Lower the crankshaft in place in the cylinder block. Center it on the top main bearing inserts and at the same time guide the connecting rods onto the connecting rod journals.

(3) Slightly lubricate the lower main bearing inserts (7, 9, and 11) and slide into the bearing caps (8, 10, and 12).

(4) Install the center main bearing cap (10) on the center main bearing journal of the crankshaft and secure to the engine block with two bolts (14) and lock washers (13). Follow the same procedure to install the front and rear main bearing caps (8 and 12).

(5) Install the connecting rod bearing caps. Do not tighten.

(6) Tighten the bolts (14) to 77 ft-lb torque. The clearance is correct when there is a slight drag on the crankshaft.

(7) Check the fit of the main bearings.

(8) Tighten all the bolts on the main bearing caps to 77 ft-lb torque.

(9) Tighten all the connecting rod nuts to 42 ft-lb torque, and secure with cotter pin.

(10) The rear main bearing also acts as a thrust washer. Tap the crankshaft toward the back of the engine and check crankshaft and thrust.

NOTE: Crankshaft end thrust is controlled by the rear main bearing flanges and is established by the bearing dimension itself. Therefore, there is no necessity for adjustment of this at assembly. Excessive end play requires bearing replacement.

(11) Install the oil pump.

(12) Install the front gear cover.

(13) Install the oil pan.

(14) Install the flywheel.

### Section IV. FUEL SYSTEM

#### 133. CARBURETOR

a. Removal, Cleaning, and Inspection. Remove and clean the carburetor as outlined in paragraphs 59a and b.

#### b. Disassembly (Fig. 40).

(1) Remove screw (4) and separate the throttle body from main body (31). Lift out gasket (20).

(2) Tap out shaft (18) and remove float (21).

(3) Disassembly is complete upon removing the attaching parts for the remaining items.

c. Reassembly. Reassemble in reverse order of step b.

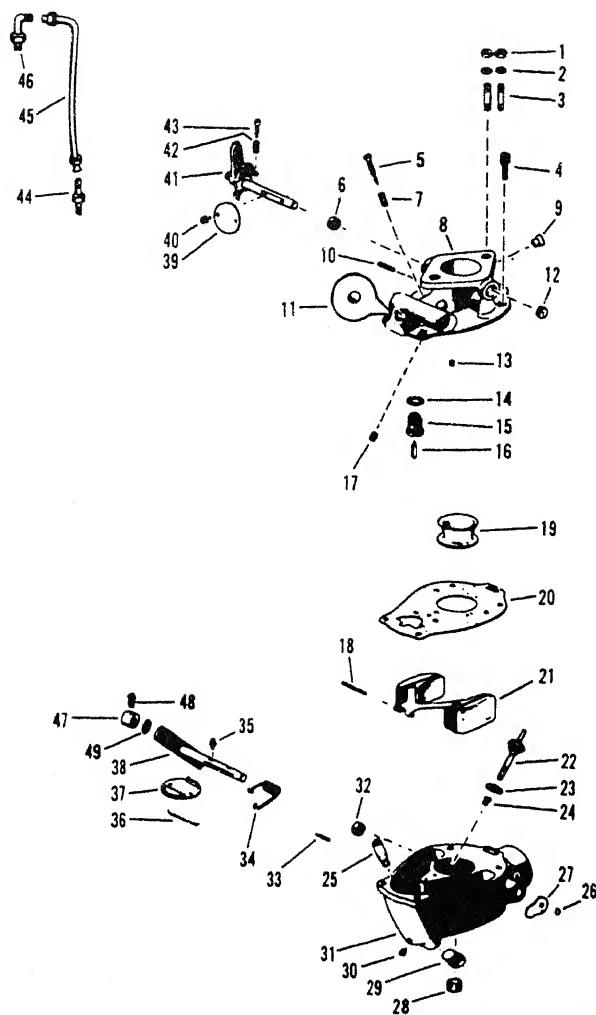
d. Installation and Adjustment. Install and adjust the carburetor as outlined in steps c and d of paragraph 59.

#### 134. GOVERNOR

#### a. Removal.

(1) Remove linkage (par. 60).

(2) Remove the two cap screws that attach governor cover to the housing. Lift off cover and gasket.



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- 1 Plain nut
- 2 Lock washer
- 3 Attaching stud
- 4 Screw and lock washer
- 5 Needle
- 6 Packing
- 7 Spring
- 8 Throttle body
- 9 Plug
- 10 Choke stop pin
- 11 Expansion plug
- 12 Throttle cup
- 13 Economizer jet
- 14 Gasket
- 15 Valve seat
- 16 Valve needle
- 17 Idle jet
- 18 Float shaft
- 19 Venturi
- 20 Gasket
- 21 Float and lever
- 22 Main nozzle
- 23 Gasket
- 24 Carburetor jet
- 25 Valve and seat
- 26 Numbering ball
- 27 Numbering plate
- 28 Strainer
- 29 Plug
- 30 Screw
- 31 Body assembly
- 32 Choke packing
- 33 Choke stop pin
- 34 Spring
- 35 Machine screw
- 36 Spring
- 37 Valve disc
- 38 Shaft
- 39 Valve throttle
- 40 Machine screw
- 41 Shaft
- 42 Spring
- 43 Screw
- 44 Tube union
- 45 Tube assembly
- 46 Tube elbow
- 47 Choke swivel
- 48 Swivel screw
- 49 Washer

Figure 40. CARBURETOR ASSEMBLY.

(3) Rotate engine clockwise until timing marks on the camshaft gear and the governor drive gear are aligned. Note which mark the governor drive gear is timed on.

**b. Disassembly (Fig. 41).**

(1) To disassemble drive shaft, remove thrust sleeve assembly (13). Remove "E" Rings (11), pressing on "E" Ring end of weight pin (10). Remove weight pin (10) and weight (12), supporting the gear as close to spider as possible in an arbor press and using a 11/32 diameter punch, remove gear and spacer (34).

(2) Disassemble the remainder of the assembly by removing the attaching parts and snap rings.

**c. Reassembly (Fig. 41).**

(1) Assemble bearings (4) in body, assemble retaining ring (3) (one only) to rocker shaft (9), assemble rocker shaft (9) in body (20), assemble the other retaining ring (3), assemble oil seal (7) and oil seal retainer (8), assemble yoke (6) holding yoke in place with fasteners (5). Supporting end of rocker shaft (9) press throttle lever (25) on rocker shaft (9) holding dimension .827 and 1.97, using a .125 drill, drill thru throttle lever hub and pin with roll pin (28). Assemble washers (2) and expansion plug (1). Assemble auxiliary lever (21) to throttle lever (25) using screws (23) and nut (24). Assemble spring (22). Assemble screw eye (27) to throttle lever (25) locking screw eye (27) in place with hex nuts (26). Assemble stud

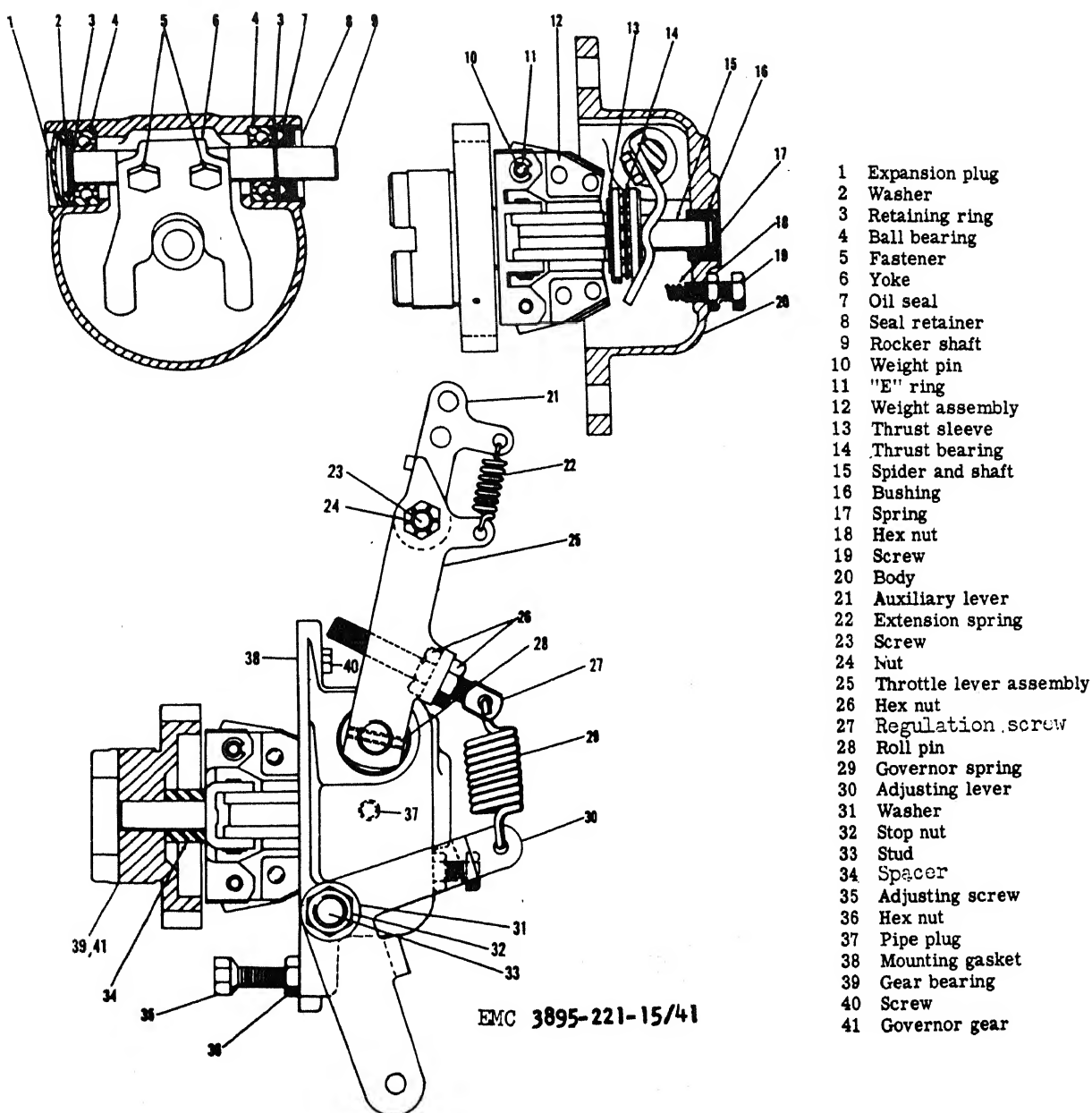


Figure 41. GOVERNOR ASSEMBLY.

(33) to body (20). Assemble spring adjusting lever (30) to stud (33), assemble washer (31) and nut (32). Assemble screw (35) locking it in place with nut (36). Assemble spring (29), assemble pipe plug (37). Assemble bumper spring (17) to screw (19), assemble nut (18) to screw (19) and screw this assembly into body locking it in place with nut (18).

(2) To assemble drive shaft, support the gear, add spacer (34) to spider and shaft assembly (15). Using end of spider shaft, press on gear. Place weight in spider, insert weight pin through spider and weight,

press knurl on weight pin flush with spider and assemble "E" Ring (11).

d. Installation. Install in reverse procedures of step a.

e. Adjustment (Fig. 41).

(1) Place tension on governor spring (29) with adjusting screw (35). Install linkage from governor throttle lever to carburetor bellcrank. Adjust length of linkage to hold bellcrank on wide open stop pin. Then

shorten linkage 7 turns. Release all spring tension and operate throttle lever manually to check for bind or lost motion in linkage.

(2) Back out bumper screw (19) until only three or four threads are engaged, and secure with lock nut (18). Start engine and idle until warmed-up to operating temperature. Obtain specified no-load speed with adjusting screw (35). Check regulation by applying and removing engine load. If regulation is too broad,

adjust regulation screw (27) to move spring nearer throttle lever hub. If governor surges (engine under load) adjust regulation screw (27) to move spring away from throttle lever hub. Lock adjustment with lock nuts (26).

(3) Bumper screw (19) is used to remove a no load surge only. If governor surges at no load, turn bumper screw (19) in a turn at a time until the surge is removed. Do not turn bumper screw in far enough to increase no load speed of engine.

## Section V. ENGINE ELECTRICAL SYSTEM

### 135. GENERATOR

a. Removal. See paragraph 66 to remove generator assembly.

b. Disassembly (Fig. 42). Disassemble the generator in index number sequence of Figure 42 by following approved shop practice.

c. Repair. Repair the generator per steps b and c of paragraph 66.

d. Reassembly and Installation. Reassemble in the reverse order of the index numbers of Figure 42. Install per paragraph 66d.

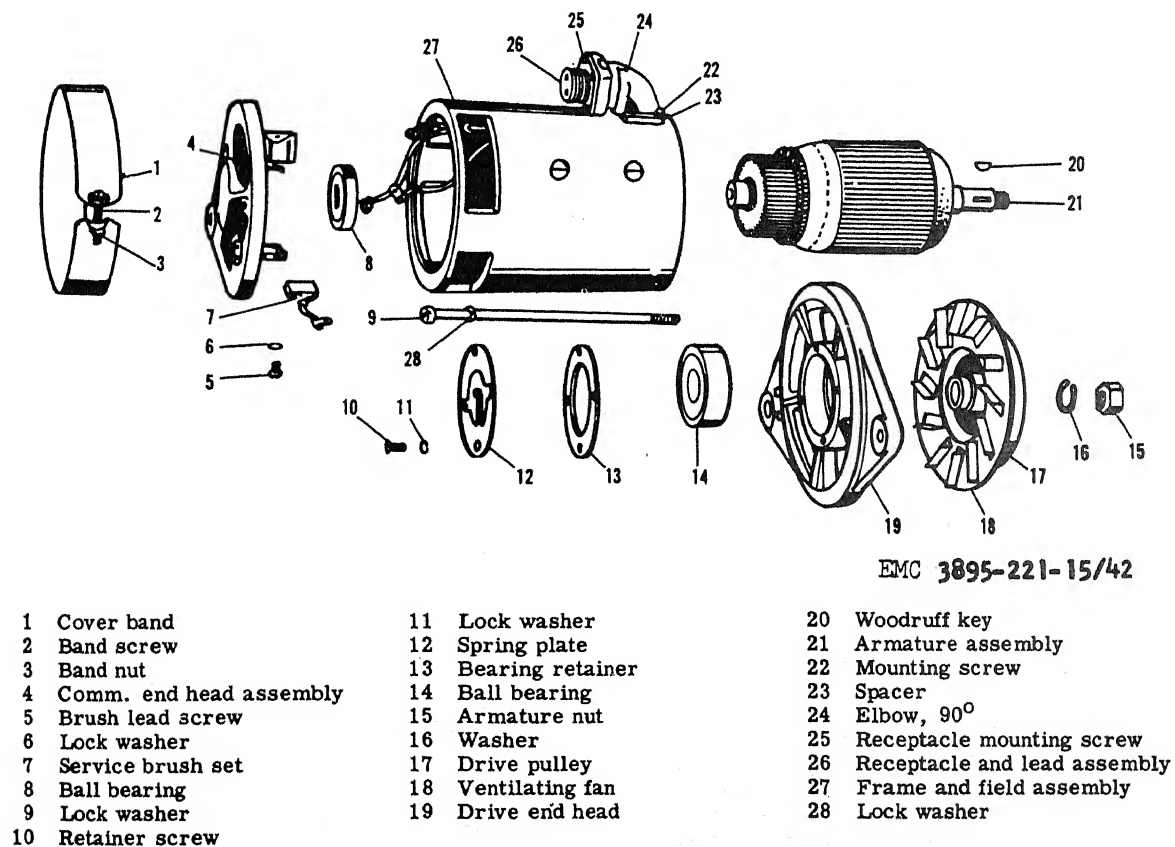
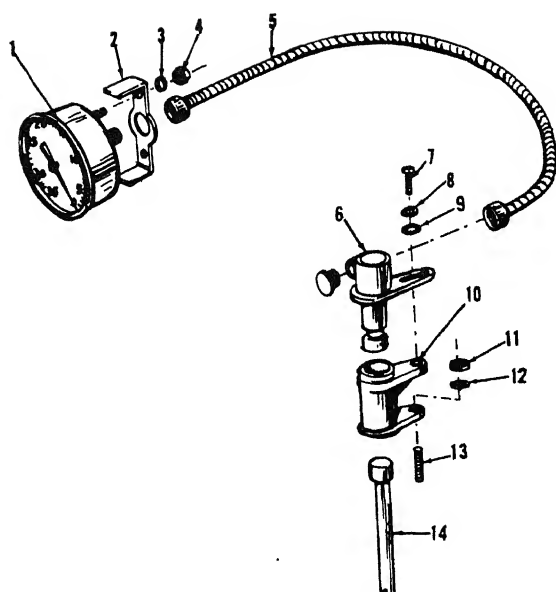


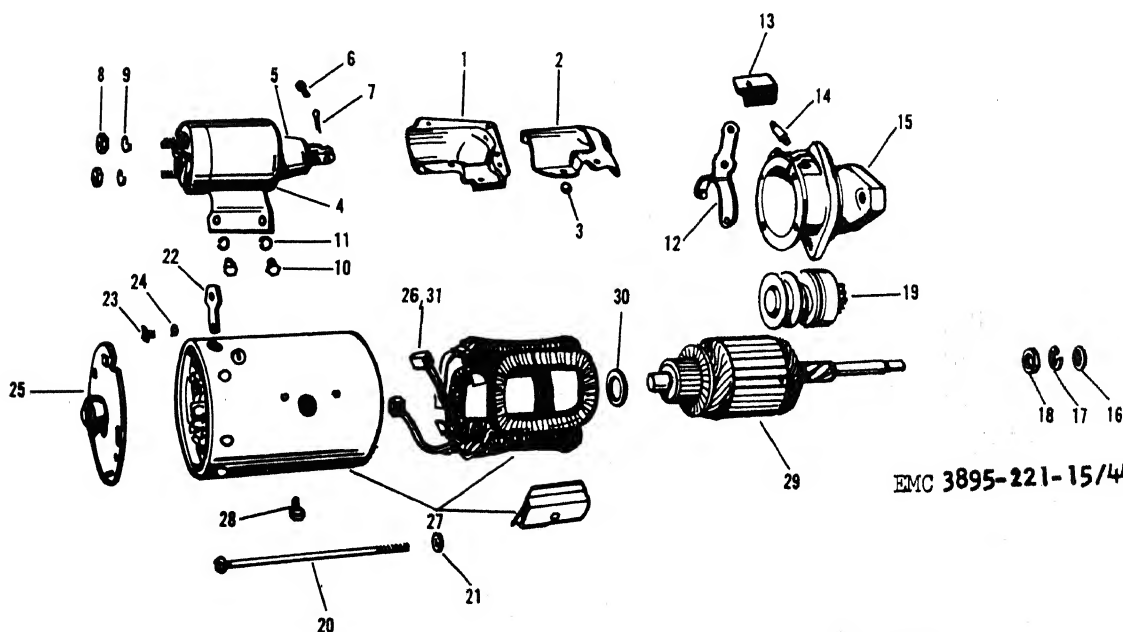
Figure 42. GENERATOR ASSEMBLY.



- 1 Tachhourmeter gage
- 2 Mounting clamp
- 3 Washer
- 4 Nut
- 5 Drive shaft
- 6 Tachometer adapter
- 7 Screw
- 8 Lock washer
- 9 Plain washer
- 10 Distributor adapter
- 11 Nut
- 12 Lock washer
- 13 Stud
- 14 Distributor drive shaft

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Figure 43. TACH-HOURMETER COMPONENTS.



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- 1 Cover, R. H.
- 2 Cover, L. H.
- 3 Screw
- 4 Solenoid switch
- 5 Moving core assembly
- 6 Link pin
- 7 Cotter pin
- 8 Nut
- 9 Lock washer
- 10 Screw
- 11 Lock washer

- 12 Yoke
- 13 Cover
- 14 Yoke pin
- 15 Pinion housing
- 16 Thrust washer
- 17 Snap ring
- 18 Retainer
- 19 Starter clutch
- 20 Thru bolt
- 21 Thrust washer

- 22 Connector
- 23 Screw
- 24 Lock washer
- 25 Head assembly
- 26 Brush plate assembly
- 27 Frame and field assembly
- 28 Flat head screw
- 29 Armature
- 30 Thrust washer
- 31 Brush set (service only)

Figure 44. STARTER MOTOR ASSEMBLY.

## 136. STARTER MOTOR

### a. Removal (Fig. 44).

- (1) Remove battery ground cable.
- (2) Remove all lead wires, support the motor, remove the attaching parts, and remove the starter motor.

b. Disassembly (Fig. 44). Disassemble per index number sequence of Figure 44 by following approved shop practice.

c. Cleaning, Testing and Repair. Refer to paragraph 68b and c for this procedure.

d. Assembly and Installation. Reverse procedures of steps b and a.

## Section VI. COOLING SYSTEM

## 137. RADIATOR

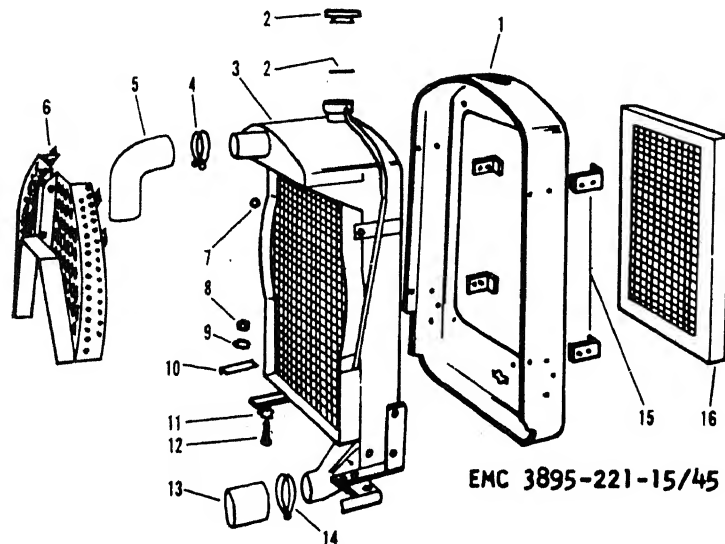
### a. Removal.

- (1) Drain radiator (1, Fig. 4) at pipe plug (7, Fig. 8).
- (2) Remove attaching parts that secures radiator to supports and hood, loosen all hoses, and lift off radiator.

### b. Disassembly and Reassembly (Fig. 45).

(1) Disassemble or reassemble the radiator and its components following index number sequence of Figure 45.

c. Cleaning and Flushing. Accomplish procedures of paragraph 78a.



- 1 Crank plate
- 2 Radiator cap
- 3 Radiator core assembly
- 4 Hose clamp
- 5 Preformed hose
- 6 Fan guard
- 7 Lock washer
- 8 Plain nut

- 9 Lock washer
- 10 Spacer
- 11 Lock washer
- 12 Cap screw
- 13 Rubber hose
- 14 Hose clamp
- 15 Radiator bracket
- 16 Radiator filter

Figure 45. RADIATOR COMPONENTS



## Section VII. MIXER ASSEMBLY

### 138. AUXILIARY WATER PUMP ASSEMBLY

a. Removal. Remove the auxiliary water pump assembly (28, Fig. 30) as outlined in paragraph 112c.

b. Disassembly (Fig. 47).

(1) Remove cotter pin (2), nut (3), washer (4), spacer (5), and withdraw the driven sheave (1) from end of shaft (18).

(2) Remove nut (8), washer (9), and separate the cover and bearing housing (7) from volute (44). Remove gasket (11).

(3) Unscrew locking plug (43), clamp shaft end in vise having jaws protected with brass plate or some other suitable means of protection, position a hardwood block against the vanes of the impeller, and remove the impeller from the shaft by tapping on the vanes in a counterclockwise direction.

(4) Withdraw the seal assembly (19) and washer (20) from the impeller end of the shaft, and then pull out shaft (18). Compress and pry outer snap ring (14) from its groove, remove outer ball bearing (15), inner snap ring (14), spacer (16), and then the inner ball bearing (15) from within the cover and bearing housing (7).

(5) Removal and disassembly of the inlet valve (22) is complete upon removal of all attaching parts.

(6) Unscrew the two cap screws (37) and separate the volute cap (36) from the volute (44).

c. Cleaning. Clean all parts with an approved cleaning solution, and except for the ball bearings and seal, blow dry with jets of compressed air. Dry the ball bearings and the seal assembly with a clean, lint-free cloth.

d. Repair. Repair of the water pump assembly is limited to discarding those parts which are distorted, ruptured, or otherwise unfit for continued service. It is usually necessary by overhaul time, for the flap valve (28), seal assembly (19), and the ball bearings (15) to be replaced with new parts.

e. Reassembly (Fig. 47).

(1) Align the holes of the washer (32), flap valve (28), valve weight (29), and secure together with screw (31) and nut (30). Attach the flap valve to the valve case (33) with screws (26). Using a new gasket (34), position the inlet valve assembly (22) over its opening on the volute (44) and secure with attaching parts.

(2) Install the seal assembly (19) and the impeller (17) onto the shaft (18) end. Clamp the shaft into a vise, place a hardwood block against the impeller vanes, and tighten the impeller securely onto the shaft by tapping on the block. Remove shaft and impeller from vise. Install locking plug (43).

(3) Position washer (20) in its seat within the cover and bearing housing (7). Insert the inner ball

bearing (15), spacer (16), and the inner snap ring (14) into the cover and bearing housing. Follow these parts with the ball bearing (15) and secure in place with snap ring (14).

NOTE: Be sure to pack the bearing cavity of the cover and bearing housing with lubricant in accordance with the Lubrication Order before installing outer bearing (15).

(4) Carefully insert shaft end through the cover and bearing housing, inner bearing, spacer, outer bearing, and then install the special washer (13) over the shaft and up to the outer bearing.

(5) With the key (12) in its shaft groove, align the groove of the sheave (1) with the key, and press the sheave onto the shaft end. Secure with spacer (5), washer (4), nut (3), and cotter pin (2).

(6) Spin the impeller by hand and check for binding or restricted movement of the shaft, sheave, and impeller. Using a new gasket (11), secure this assembly to the volute (44) with the proper attaching parts.

f. Installation. Install the water pump assembly (28, Fig. 30) as outlined in paragraph 112a. Be sure to adjust for proper deflection of the drive belts, tighten the pump drain plug (35, Fig. 30), and prime the pump, if necessary.

### 139 POWER LOADER SKIP

a. Removal.

(1) Lower the skip (1, Fig. 1) to the ground.

(2) Stop the engine.

(3) Remove the cable clamp bolts from both winding drums (9, Fig. 1) and pull the skip cable (8) from the drums and out of the cable guides which are welded to the skip (1) sides.

(4) Remove the attaching parts that secure bearings (7), and withdraw the skip, pivot shaft, and the skip shaker hanger as one complete assembly.

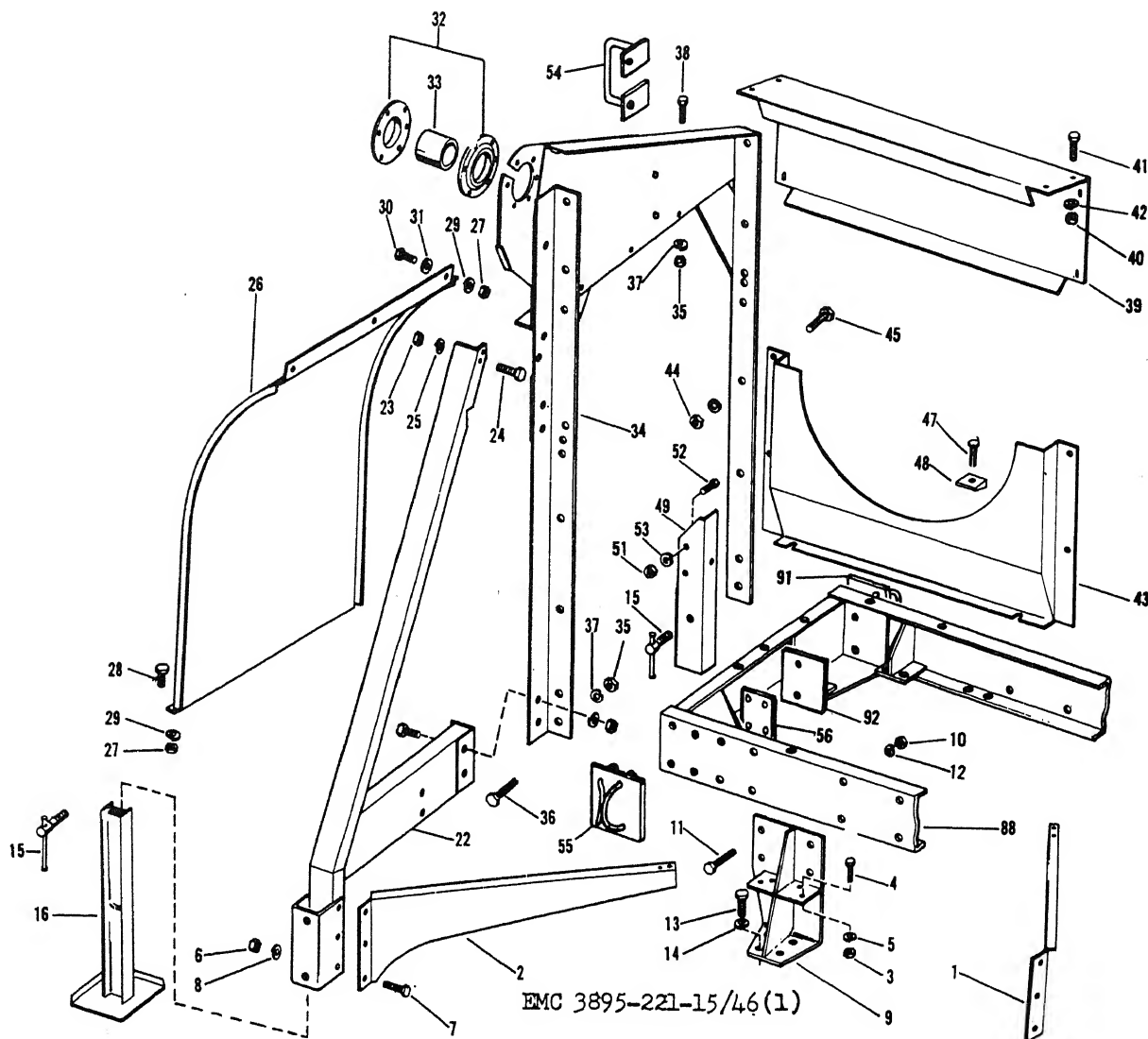
b. Disassembly.

(1) Remove the flat head rivets and separate the bearings from each of the shaker hangers. The hangers may be pulled from the pivot shaft ends at any time after the bearings have been removed.

(2) Slide collars and washers from shaft ends. Loosen jam nuts, set screws, nuts, and withdraw the pivot shaft from the riveted skip saddle bearings (that part which holds the skip to the pivot shaft).

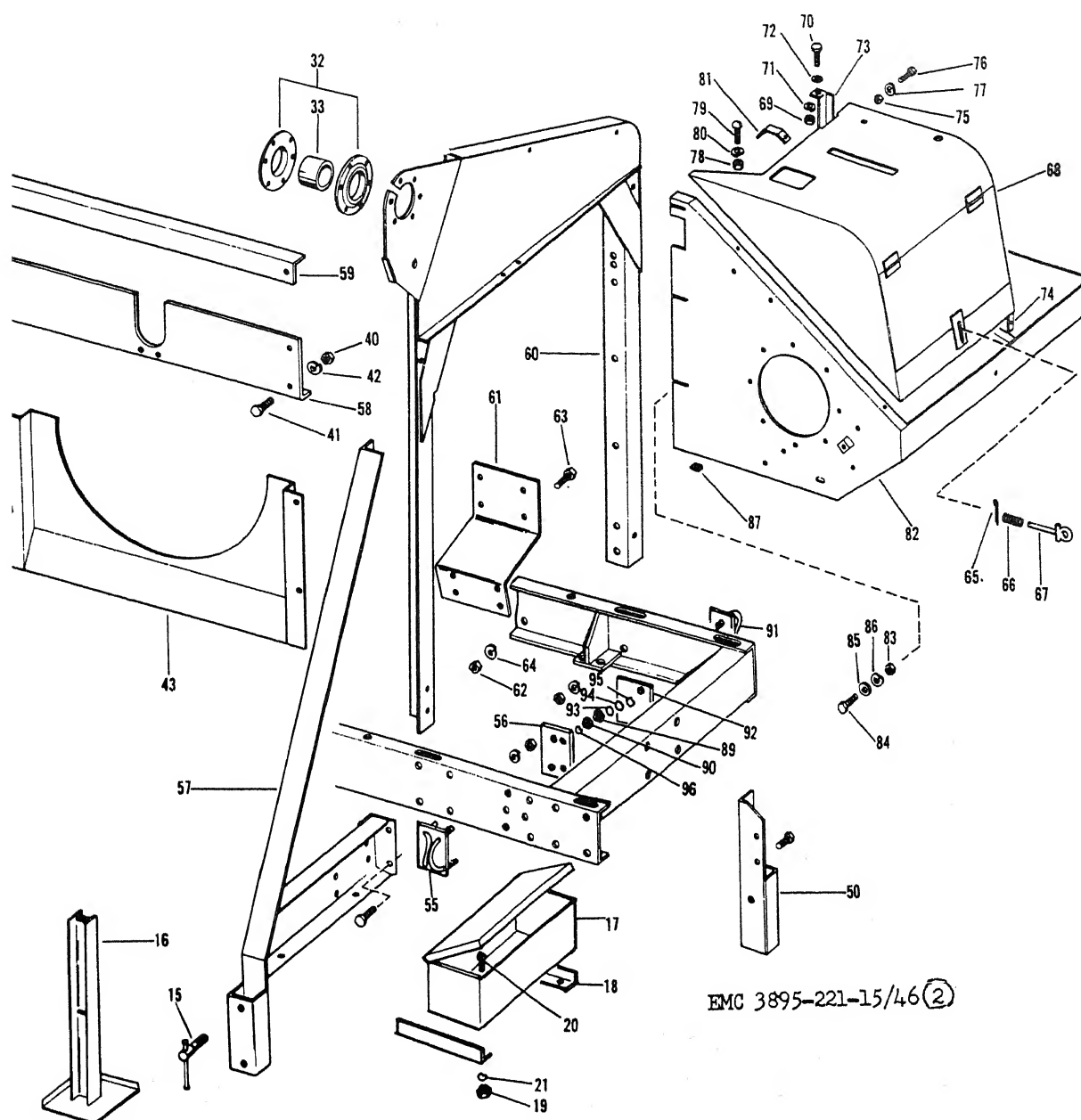
(3) Removal and disassembly of the skip rollers (10, Fig. 1) and brackets is complete upon removal of the attaching parts and jam nuts.

(4) Although not a part of the skip assembly, the



- |                              |                       |                               |
|------------------------------|-----------------------|-------------------------------|
| 1 Support brace, L. H.       | 20 Machine bolt       | 39 Rear tie plate             |
| 2 Support brace, R. H.       | 21 Lock washer        | 40 Hex nut                    |
| 3 Hex nut                    | 22 Leg support, R. H. | 41 Machine bolt               |
| 4 Machine bolt               | 23 Hex nut            | 42 Lock washer                |
| 5 Lock washer                | 24 Machine bolt       | 43 Front and rear drum shield |
| 6 Hex nut                    | 25 Lock washer        | 44 Hex nut                    |
| 7 Cap screw                  | 26 Chain guard        | 45 Machine bolt               |
| 8 Lock washer                | 27 Hex nut            | 46 Lock washer                |
| 9 Axle support front bracket | 28 Machine bolt       | 47 Machine bolt               |
| 10 Hex nut                   | 29 Lock washer        | 48 Bevel washer               |
| 11 Cap screw                 | 30 Machine bolt       | 49 Rear leg support, R. H.    |
| 12 Lock washer               | 31 Flat washer        | 50 Rear leg support, L. H.    |
| 13 Cap screw                 | 32 Bearing socket     | 51 Hex nut                    |
| 14 Lock washer               | 33 Bearing            | 52 Cap screw                  |
| 15 Lock screw                | 34 Frame strut, R. H. | 53 Lock washer                |
| 16 Stabilizer leg            | 35 Hex nut            | 54 Handle                     |
| 17 Tool box                  | 36 Cap screw          | 55 Front tie-down-eye         |
| 18 Box support               | 37 Lock washer        | 56 Back-up plate              |
| 19 Hex nut                   | 38 Machine bolt       | 57 Leg support                |

Figure 46. MIXER FRAME AND FABRICATED PARTS (1 of 2)



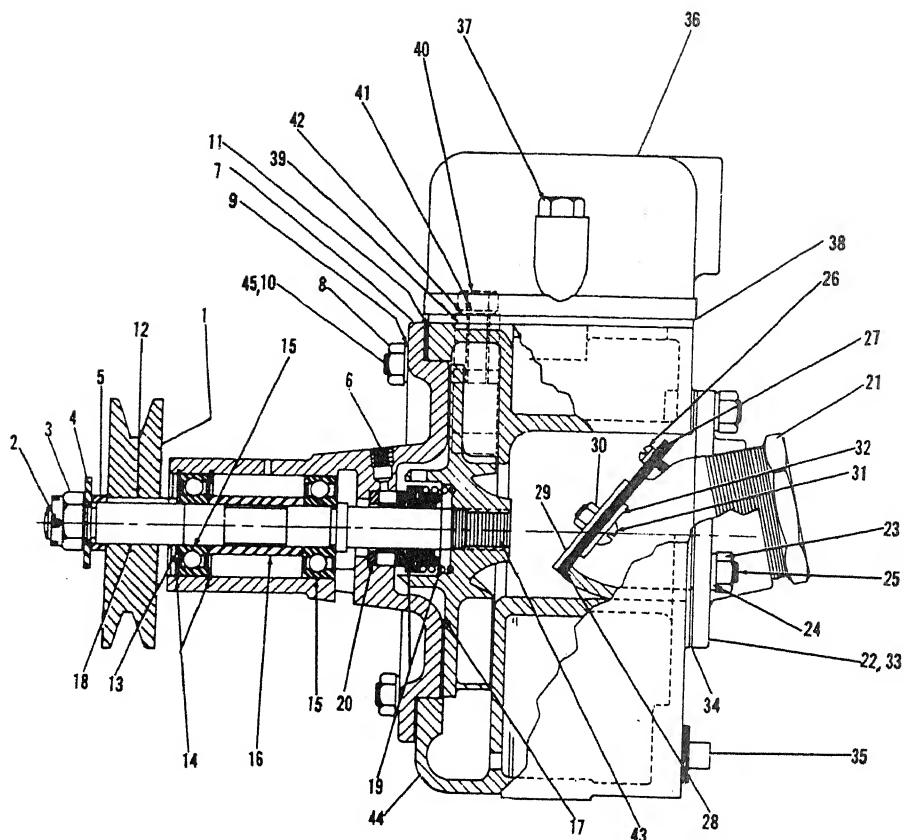
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58 Tie plate  
59 Tie angle  
60 Frame strut, L. H.  
61 Axle support rear bracket  
62 Hex nut  
63 Cap screw  
64 Lock washer  
65 Cotter pin  
66 Spring  
67 Door fastener  
68 Countershaft cover  
69 Hex nut  
70 Machine bolt

71 Lock washer  
72 Flat washer  
73 Cover support angle  
74 Cover extension  
75 Hex nut  
76 Cap screw  
77 Lock washer  
78 Hex nut  
79 Stove bolt  
80 Lock washer  
81 Clip  
82 Countershaft support  
83 Hex nut

84 Cap screw  
85 Flat washer  
86 Lock washer  
87 Bevel washer  
88 Frame  
89 Half nut  
90 Hex nut  
91 Back tie-down-eye  
92 Back-up plate  
93 Half nut  
94 Hex nut  
95 Lock washer  
96 Lock washer

Figure 46. MIXER FRAME AND FABRICATED PARTS (2 of 2)



EMC 3895-221-15/47

- |                             |                  |
|-----------------------------|------------------|
| 1 Driven sheave             | 24 Lock washer   |
| 2 Cotter pin                | 25 Stud          |
| 3 Castle nut                | 26 Machine screw |
| 4 Flat washer               | 27 Keeper        |
| 5 Spacer                    | 28 Flap valve    |
| 6 Pipe plug                 | 29 Valve weight  |
| 7 Cover and bearing housing | 30 Hex nut       |
| 8 Hex nut                   | 31 Machine screw |
| 9 Lock washer               | 32 Washer        |
| 10 Stud                     | 33 Valve case    |
| 11 Gasket                   | 34 Valve gasket  |
| 12 Straight key             | 35 Pipe plug     |
| 13 Special washer           | 36 Volute cap    |
| 14 Snap ring                | 37 Cap screw     |
| 15 Ball bearing             | 38 Cap gasket    |
| 16 Spacer                   | 39 Peeler        |
| 17 Impeller                 | 40 Cap screw     |
| 18 Shaft                    | 41 Lock washer   |
| 19 Seal assembly            | 42 Lock washer   |
| 20 Washer                   | 43 Locking plug  |
| 21 Pipe bushing             | 44 Volute        |
| 22 Inlet valve              | 45 Stud          |
| 23 Hex nut                  |                  |

Figure 47. WATER PUMP ASSEMBLY

following parts are related directly with the skip in-so-far as their removal cannot be accomplished without first removing the skip (See Fig. 46):

(5) Removal and disassembly of the charging sub-chute, upper and lower splash shields (58 and 43), skip locking hook (17, Fig. 1) is complete upon removal of their respective attaching parts.

(6) Remove the skip hoist cable clamp from the reduction drum (20, Fig. 2) and unwind the hoist cable. Using a gear puller, pull the control side (right side) winding drum from the top winding shaft (22, Fig. 1) and tap out its gib key. Grasp the reduction drum and pull it and the winding shaft as an assembly from the mixer. Remove three bolts and pull the reduction drum and the engine side winding drum from the top winding shaft. Tap out remaining gib key.

#### c. Cleaning and Repair.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly. Scrape the skip clean of all encrusted deposits and paint all exposed metal surfaces to prevent rust.

(2) Inspect all parts for dents, cracks, and distortion. Discard those parts which cannot be effectively repaired by pounding back into shape or welding.

(3) Roll the pivot shaft on a perfectly smooth surface and test for distortion; inspect bearing surfaces of shaft for smoothness. Discard a defective shaft.

(4) Discard the cable if it is frayed, contains sharp kinks, or is otherwise unserviceable. Immediately after cleaning, apply clean all-purpose grease to a pad made from burlap, and coat the cable with grease as protection against rust.

d. Reassembly and Installation. Reverse procedures of step b.

### 140. CLUTCH AND BRAKE CONTROLS

a. Removal and Disassembly. Removal and disassembly of the clutch and brake control linkage system is complete upon removal of the attaching parts of a component, and withdrawing that component from the part to which it is attached in the sequence order of the items contained in Figure 47. Accomplish the following procedures before removing any of the control system:

(1) Start the engine and lower the skip to the ground.

(2) Remove those parts of the housing, doors, etc., which restrict access to the parts to be removed.

(3) Use only a leather or soft metal mallet when it is necessary to drive one part from another.

#### b. Cleaning and Repair.

(1) Wash all parts with an approved cleaning solvent; dry thoroughly with a clean, lintless cloth or jets of compressed air if available.

(2) Inspect all bearing surfaces for roughness, out-of-round wear, or corrosion.

(3) Inspect all tubes and shafts for distortion by rolling them on a perfectly flat surface; discard those parts which cannot be restored to serviceable standards by using either heat or by hammering.

(4) Install a new brake lining on the brake band. Be sure threaded portion of the brake band welded bolt is in good condition.

(5) Discard all parts which are unfit for continued service or are non-repairable.

#### c. Reassembly and Installation.

(1) Reassemble and install the brake band components.

(2) Reassemble and install the clutch and brake control components in the reverse order of the index number sequence of Figure 47.

(3) Refer to the Lubrication Order and service all lubrication points as specified.

(4) Upon actuating the brake lever (1, Fig. 26) and clutch lever (6), check for proper operation of the components involved. Adjust the brake band.

### 141. DISCHARGE CHUTE CONTROLS

#### a. Removal (Fig. 29).

(1) Remove the shoulder bolt which connects the lower link bar (4, Fig. 28) to the end of the output lever and shaft assembly (8, Fig. 29).

(2) Remove nuts, cap screw, washers, and lift the discharge chute gear case and handwheel assembly (19, Fig. 2) as an assembly from the mixer frame.

#### b. Disassembly (Fig. 29).

(1) Remove gib key (1), and pull handwheel (2) and spacer (3) from the outer end of the pinion and shaft assembly (15).

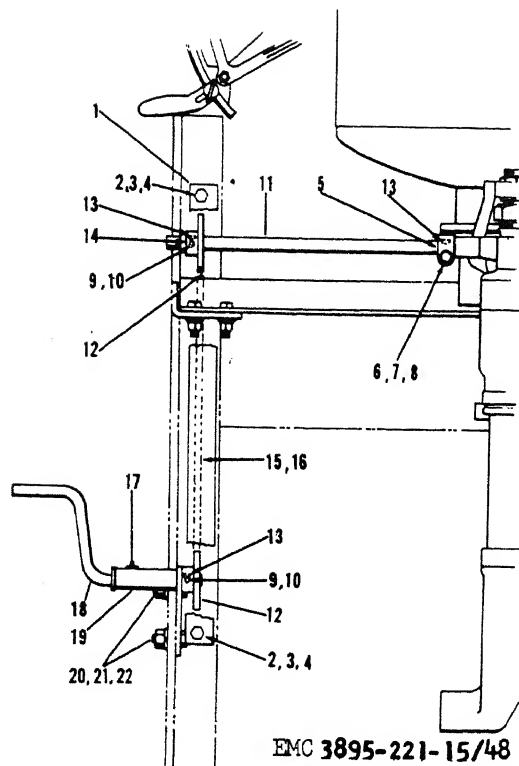
(2) Remove set screw and collar (7), hex nuts (13), and separate cover plate (11) from the gear case (18). Press the output lever and shaft assembly (8) out of the cover plate, which will also force gear (17) from the shaft.

(3) Pull pinion and shaft (15) out of the gear case (18) bore. Remove bushings (9 and 16).

#### c. Cleaning and Repair.

(1) Wash all parts with an approved cleaning solution and dry thoroughly. Be sure lubrication fitting holes are open and free of all grease.

(2) Inspect the pinion and gear for uneven or



- 1 Chain guard
- 2 Hex nut
- 3 Machine bolt
- 4 Lock washer
- 5 Coupling
- 6 Hex nut
- 7 Machine bolt
- 8 Lock washer
- 9 Set screw
- 10 Jam nut
- 11 Operating shaft
- 12 Sprocket
- 13 Woodruff key
- 14 Spacer
- 15 Drive chain
- 16 Connecting link
- 17 Lube fitting
- 18 Operating lever
- 19 Bearing
- 20 Hex nut
- 21 Machine bolt
- 22 Lock washer

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Figure 48. FREEWAY VALVE CONTROL.

broken teeth. Shaft surfaces should be smooth and without blemishes. Inspect bushings for uneven wear.

(3) Discard all non-repairable parts and replace them with new parts having the same part number.

d. Reassembly and Installation.

(1) Refer to Figure 29. Install bushings (9 and 16) into their bores, and insert the pinion and shaft (15) in the upper bore of gear case (18).

(2) Insert the output lever and shaft assembly (8) into the bore of the cover plate (11), position gear (17) over end of the shaft, and press into place over key (10).

(3) Position the assembled cover plate and gear over and into place on the gear case (18); secure together with attaching parts. Assemble set screw and collar (7) over the protruding end of output lever and shaft assembly, and tighten set screw.

(4) Install the three lubrication fittings (6), service in accordance with the Lubrication Order, Figure 9. Connect lower link bar (4, Fig. 28) and adjust.

## 142. FREEWAY VALVE CONTROL

a. Removal and Disassembly (Fig. 48).

(1) Be sure that the water tank (7, Fig 1) is empty before attempting to remove the freeway valve control (19, Fig. 1).

(2) Disassembly of the valve control is complete upon removal of the following items (Refer to Fig. 48).

(3) Remove guard (1), loosen the hex nut (6) of coupling (5), loosen jam nut (10) and set screw (9) of the upper sprocket (12), and withdraw the operating shaft (11). Lift off chain (15).

(4) Loosen jam nut (10) and set screw (9) of the lower sprocket (12). Separate the sprocket and the operating lever (18). Remove bearing (19).

b. Cleaning and Repair.

(1) Wash all parts in an approved cleaning solvent, then dry thoroughly. Use a stiff-bristle brush to remove all grease from the drive chain.

(2) Discard all parts that are unfit for continued service.

(3) Inspect the sprockets for distorted or broken teeth.

(4) Since the entire chain does not contact the sprockets, worn portions may be shifted to the non-contacting positions upon reassembly.

c. Reassembly and Installation (Fig. 48).

(1) Insert keys (13) in the keyways of shaft (11), install coupling (5) over one end of the shaft, and a sprocket (12) and a spacer (14) over the opposite end; insert this end

into the angle mounting hole and connect the coupling end to the freeway valve by tightening coupling nut (6).

(2) Secure bearing (19) in place with its attaching parts, position the chain (15) over the upper sprocket and connect the ends with link (16), engage the teeth of the lower sprocket (12) with the chain and align sprocket hole with that of the bearing (19).

(3) Insert operating lever (18) end through the bearing (19), install key (13) and sprocket (12), and secure in place with set screw (9).

(4) Tap the upper sprocket (12), in alignment with the lower sprocket and secure with its set screw. Position the chain guard (1) over its mounting holes and secure. Install lubrication fitting (17) and service in accordance with the Lubrication Order, Figure 9. Test control for proper operation.

#### 143. MIXER DRUM

##### a. Removal.

- (1) Remove the discharge chute and shaft assembly.
- (2) Remove the water tank assembly.
- (3) Remove the freeway valve and piping.
- (4) Remove the freeway valve control
- (5) Lower the skip and remove the top winding shaft and drum assemblies. Remove skip.
- (6) Remove the lifting bail and its anchors (18 and 19, Fig. 50).

(7) Remove tie plates (39 and 58, Fig. 46), tie angle (59, Fig. 46), right side upper frame strut (34, Fig. 46), and chain guard (26, Fig. 46).

(8) Uncouple the connecting link of the drum drive chain. Install hooks of an overhead crane sling into the openings at either end of the mixer drum, take up sling slack, and lift the drum up and out of the drum roller and shaft assemblies. Lower the drum onto wooden supports (2" x 4"s) to protect the drum chain sprocket segments from damage.

b. Disassembly (Fig. 27). Disassembly of the mixer drum is complete upon removal of the attaching parts for the combination buckets and blades (7), buckets (8), and sprocket segments (12). Drip rings (2 and 3) are riveted to the drum shell (14); removal of the rings is accomplished by drilling out the rivets with a 3/8 inch drill.

##### c. Cleaning and Repair.

(1) Chip or scrape away accumulated dried concrete from the mixer drum. Wash, dry thoroughly, and protect exposed metal surfaces by coating them with an approved paint.

(2) Repair drum cracks using accepted welding procedures. Discard worn or excessively distorted buckets

and blades and install new parts in their places. Replace entire drum if damage is complete and cannot be corrected satisfactorily.

##### d. Reassembly (Fig. 27).

(1) Position and secure the buckets and blades (7) and buckets (8) alternately in place within the drum shell (14). All cap screws (5) are inserted from the inside of the drum and secured with nuts (4) on the outside.

(2) Wrap the base band (13) around the shell (14) so that the holes are aligned with those of the shell, and the band ends are butted together. Overlap the ends of two segments (12) as shown in Figure 27, secure these segments to the shell through the last hole at either end of the base band with bolts (10) inserted from the outside and attached with nuts (9) on the inside of the shell.

(3) Place the next sprocket segment (12) into position either over or under the end of the mounted sprocket which is aligned with the remaining hole at the butted end of the base band (13). Once the ends of the base band are secured, it is simply a matter of repetition to install the remaining segments.

##### NOTE

The flat end of the segments (12) are always mounted next to the base band; the raised end overlaps the flat end of the preceding segment.

(4) If the drip rings (2 and 3) were removed, re-install them with rivets (1) using standard, accepted riveting procedures.

##### e. Installation.

(1) Position the hooks of an overhead crane sling into the openings at each end of the mixer drum, lift the drum up and swing into position over the drum rollers and shafts (Fig. 49).

(2) Wrap the drum drive chain around the drum and around the chain drive sprocket located on the counter-shaft assembly. Be sure that the chain links are evenly engaged with the sprocket teeth and drum sprocket segments, adjust to eliminate chain slack, and secure ends of chain together with connecting link.

(3) Erect the vertical superstructure, cross-braces, shields, and drum guards.

(4) Install the water tank assembly.

(5) Install the freeway valve assembly and piping.

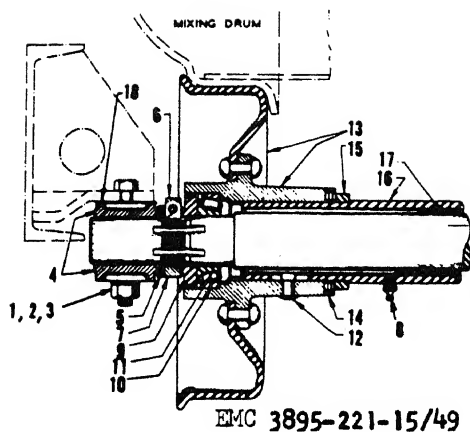
(6) Install the freeway valve control

(7) Install the top winding shaft and cable drums.

(8) Install the skip.

(9) Install the discharge chute assembly.

(10) Service all lubrication points in accordance with the Lubrication Order, Figure 9. Start engine and



- 1 Hex nut
- 2 Cap screw
- 3 Lock washer
- 4 Bearing half
- 5 Shaft washer
- 6 Cap screw
- 7 Adjusting ring
- 8 Lube fitting
- 9 Grease retainer
- 10 Bearing cup
- 11 Bearing cone
- 12 Key pin
- 13 Drum roller and hub assembly
- 14 Take-up washer
- 15 Spacer
- 16 Sleeve
- 17 Shaft
- 18 Shim

Figure 49. DRUM ROLLERS AND SHAFT

operate mixer; observe all components and assemblies for proper response when actuated in their normal sequence. Make adjustments as necessary by referring to the applicable paragraphs for the equipment involved.

#### 144. MIXER DRUM ROLLERS AND SHAFTS

##### a. Removal

- (1) Remove the mixer drum.
- (2) See Figure 49. Place wooden supports under the roller shafts to prevent them from dropping as they are removed.
- (3) Remove nuts (1) and lower the entire shaft, rollers, and bearings from the mixer frame as an assembly.

##### NOTE

With the exception of take-up washers (14) and the spacer (15), both ends of the roller shaft have identical components. Therefore, it is to be remembered that the end having these additional parts is installed to the forward (skip) end of the mixer frame.

##### b. Disassembly (Figure 49).

- (1) Remove bearing halves (4), washers (5), loosen screws (6) and unscrew the adjusting rings (7).
- (2) Shifting the shaft (17) sharply to one end will force the grease retainer (9) out of the roller recess; withdraw bearing cone (11). Shift shaft (17) in the opposite direction and repeat removal procedure. Withdraw shaft (17) carefully. Remove bearing cups (10) with a puller tool.
- (3) Center-punch key pin (12) and drill out to remove. Press roller and hub assemblies (13) from sleeve (16) using an arbor press.

##### c. Cleaning and Repair.

- (1) Wash all parts with an approved cleaning solution and dry thoroughly. Do not use compressed air to dry bearing cones.
- (2) Test sleeve (16), shaft (17) and roller and hub assemblies (13) for distortion, flat spots, cracks, or other signs of unserviceability.
- (3) Inspect inner surfaces of bearing halves (4) and cups (10) for pitting or scoring; discard parts having these defects.
- (4) Discard the roller and hub assemblies (13) if the drum contacting surface of the rollers is dented or worn excessively.

##### d. Reassembly (Fig. 49).

- (1) Press the rear roller and hub assembly (13) onto the end of sleeve (16) having the shortest distance from the sleeve end to the sleeve shoulder against which the hub will be pressed.
- (2) Install spacer (15), three take-up washers (14), and the forward end roller and hub assembly (13) in that order over the opposite end of the sleeve (16). Insert key pin (12) through the slot inside of the sleeve and out through the hole of the hub casting as shown. Position a suitable bar anvil inside of the sleeve and against the pin head; peen end of pin shaft over the hub outer surface as shown in Figure 49.

NOTE: The maximum distance between innermost edges of the rollers is not to exceed 34-19/32 inches. The minimum distance must not be less than 34-33/64 inches.

- (3) Place bearing cups (10) squarely into their seating area within the hub recesses. Insert shaft (17) into the sleeve (16) so that the same lengths of the shaft protrude at each end of the sleeve.

- (4) Install cones (11) over shaft ends and firmly up to the cups (10), guide grease retainers (9) evenly into the hubs, turn adjusting rings (7) onto the threaded portion of the shaft and snugly against the retainers, and tighten cap screws (6). Measure distance between roller inner surfaces as stated above and achieve required setting.



(5) Install washers (5) and bearing halves (4) onto shaft ends.

e. Installation.

(1) Locate roller and shaft assembly into place under the mounting holes of the frame and secure bearing halves with cap screws (2) and nuts (1).

(2) Lubricate shaft at fittings (8) in accordance with specified lubricant of Lubrication Order, Figure 9.

(3) Install mixer drum.

145. DISCHARGE CHUTE

a. Removal and Disassembly (Fig. 28).

(1) Disconnect the lower link bar (4) from the lever of the output lever and shaft assembly (8, Fig. 29).

(2) Remove the link bars (4, 5, Fig. 28), sealing segment (10), discharge chute (16), and the drum shield.

(3) Remove either of two cotter pins (21), shift splash shield in that direction, and withdraw the shield from its mounting holes in the chute shaft (22) hangers.

(4) Remove four nuts (23) and bolts (24), and withdraw the chute shaft (22) assembly. Loosen set screws of collar (26), left hanger bearing (27), and slide these parts from the shaft end.

(5) Disassembly is complete upon removal of the above stated items.

b. Cleaning and Repair.

(1) Wash all parts in an approved cleaning solution and dry thoroughly. Clean holes of lubrication fittings (28).

(2) Items which cannot be pounded or welded into serviceable condition must be discarded and replaced with new parts having the same part numbers.

(3) Apply paint to all exposed metal surfaces to prevent rust from accumulating.

c. Reassembly and Installation (Fig. 28).

(1) Install the hanger bearing (27) and set collar (26) over the left end of the chute shaft (22); align bearing holes with their mounting holes and secure shaft assembly to the mixer.

(2) Reassembly and installation is complete upon securing the remaining components in place with their respective attaching parts.

(3) Install the lubrication fittings (28) into the vertical angles and directly in back of the hanger bearings (27). Service in accordance with specifications of the Lubrication Order (Fig. 9).

(4) Connect the lower link bar (4) to the lever of the output lever and shaft assembly (8, Fig. 29). Actuate

discharge chute handwheel (6, Fig. 2) and test for proper operation. Adjust set screws (4, Fig. 29) until desired locking of the chute is achieved when in the mixing or up position.

146. PUMP TO FREEWAY VALVE PIPING SYSTEM

a. Removal and Disassembly (Fig. 30). Removal and disassembly of the piping system is complete upon disconnecting the items in the order of index number sequence shown in Figure 30.

b. Repair. Repair of the piping system components is accomplished by chasing (re-threading) damaged pipe threads, or discarding items which are no longer serviceable and replacing them with new parts having the same dimensions or part numbers.

c. Reassembly and Installation (Fig. 30). Reassemble and install the piping system components in essentially the reverse order of the item number sequence shown in Figure 30. If the pump (28) was drained of its contents upon removal, prime the pump by adding water through the priming cap (13) opening.

147. WATER TANK

a. Removal (Fig. 50).

(1) Remove nuts (1), bolts (2), and lift the entire water tank as an assembly up and off the lifting bail (18).

(2) Be careful not to damage gasket (5) when removing the tank. Keep the two nuts and cap screws with the tank so that they may be properly re-used upon installation.

b. Disassembly (Fig. 32).

(1) Removal and disassembly of the water tank air check valve (8).

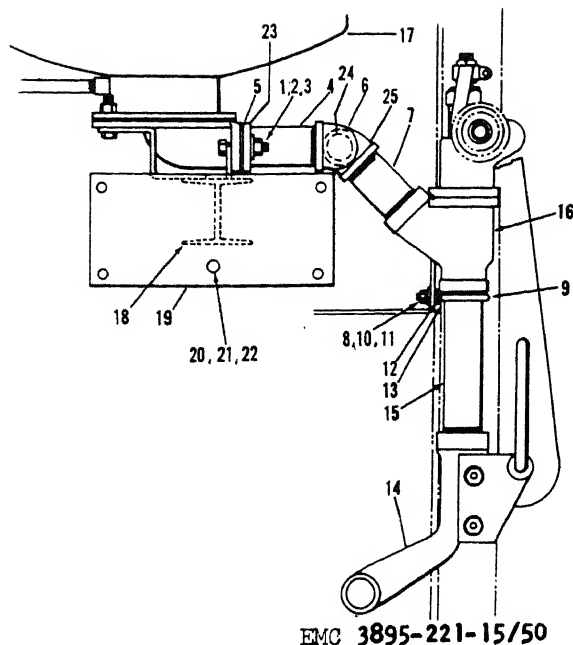
(2) Remove couplings (1) and support (2). Unscrew nipples (3 and 4), withdraw guard rods (5), and separate the upper and lower gauge cocks (6) from the glass tube (7).

(3) Remove the remaining four nuts (35) and cap screws (36), and lift off outlet elbow (42) and its gasket (39).

(4) Remove nuts (10) and withdraw the entire operating lever mechanism (9), housing (34), quadrant (30), and lift and (24) as an assembly from the side of tank (53).

(5) Remove thumb screw (14), set screw (25), nut (15), pipe plug (21), loosen gland (19), and tap shaft (22) out of the housing (34) from the plug side. Pull lever (18) from the shaft. Remove the attaching parts that secure quadrant (30) to the housing.

(6) Remove the bellows assembly from the opening at the bottom of the water tank. Remove the two hose clamps (45), the insert bar (47), and pull bellows (52) from spider (48). Disassemble the bellows (only when necessary) by removing the guide (49) and the inner and outer stiffener rings (50 and 51) alternately.



- 1 Hex nut
- 2 Machine bolt
- 3 Plain washer
- 4 Flanged pipe
- 5 Gasket
- 6 Elbow
- 7 Nipple
- 8 Hex nut
- 9 "U" bolt
- 10 Plain washer
- 11 Lock washer
- 12 Bar
- 13 Bar
- 14 Nozzle
- 15 Nipple
- 16 Freeway valve assembly
- 17 Water tank assembly
- 18 Lifting bail
- 19 Anchor
- 20 Hex nut
- 21 Machine bolt
- 22 Lock washer
- 23 Pipe flange
- 24 Nipple
- 25 Elbow

Figure 50. WATER TANK INSTALLATION

c. Cleaning and Repair.

(1) Wash all parts (except the bellows) in an approved cleaning solvent, and dry thoroughly. Wash the bellows only in clear water; do not use soaps or detergents.

(2) Inspect all parts for distortion, cracks, or other signs of unserviceability. Discard these parts and replace them with new parts having the same part numbers. Stretch the bellows by hand and replace it if there are cracks or thin areas visible.

(3) Discard the measuring plate (29) if it is scratched excessively and the lettering is illegible.

d. Reassembly (Fig. 32).

(1) Reassemble the bellows (52) by installing an outer stiffener ring (51) into the center groove or fold of the bellows, and then alternately install the inner rings (50) on either side of the outer ring, followed by the outer rings, inner rings, etc. The guide (49) is installed in the lower groove as shown. Secure the bellows to the spider (48) using keeper (46), insert bar (47), and clamps (45). With the tank (53) on its side, install the bellows assembly through the tank bottom opening so that the spider (48) can ride on the track formed

against the shaft shoulder. Install pipe plug (21), gland (19), secure operating lever (18) to the shaft (22) with its attaching parts and key (23).

(3) Align the holes of quadrant (30) with those in the housing (34) and secure with attaching parts and thumb screw (14). Install set screw (25) into its hole in the lift rod.

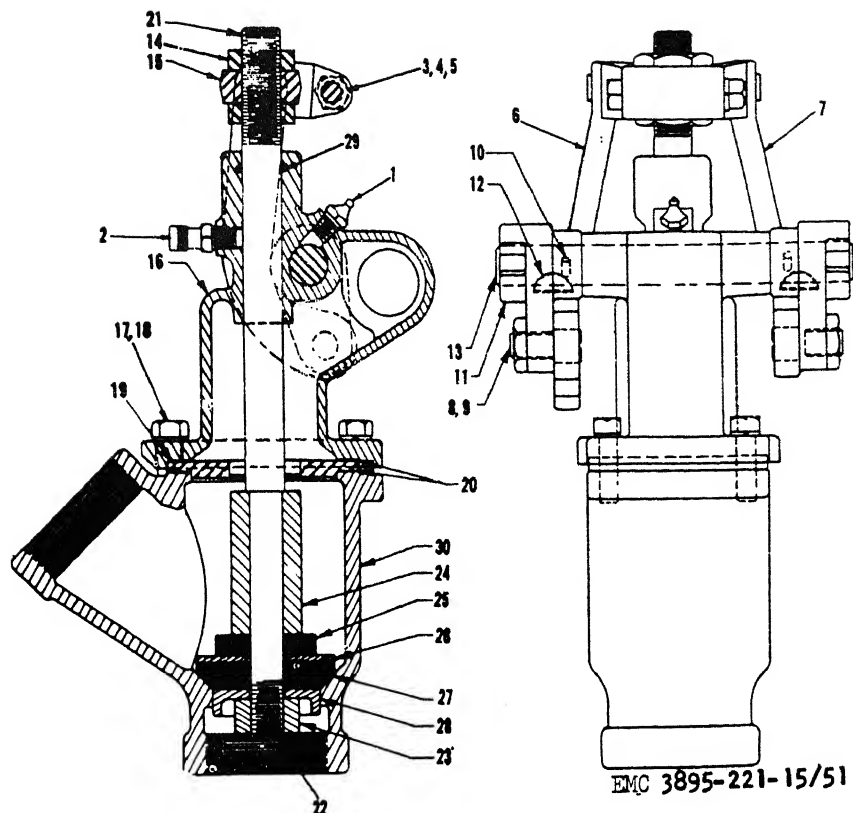
(4) Using a new gasket (13), position the assembled quadrant and lever in place on the water tank side. Be sure that the forked end of the lift rod engages pin (44), and then secure assembly with nuts (10).

(5) Using a new gasket (39), secure the outlet elbow (42) to the tank bottom with its attaching parts. Screw the check valve assembly (8) into the tank top hole so that its side opening is in alignment with the gauge nipple hole at the tank bottom.

(6) Install nipples (3 and 4); assemble glass tube (7) to gauge cocks (6), and secure cocks to nipples with couplings (1). Be sure support (2) is in place over the couplings, and guard rods (5) are inserted into the gauge cocks.

e. Installation (Fig. 50).

(1) Using a new gasket (5), seat the assembled water tank (17) into place over the lifting bail (18) so that the two holes for cap screws (38, Fig. 32) are aligned with slotted holes of the lifting bail. Secure tank outlet elbow flange and the flanged pipe (4) to the lifting bail with bolts (2) and nuts (1).



- |                     |                   |                    |
|---------------------|-------------------|--------------------|
| 1 Lube fitting      | 11 Lever          | 21 Valve stem      |
| 2 Lube fitting      | 12 Woodruff key   | 22 Cotter pin      |
| 3 Hex nut           | 13 Plunger shaft  | 23 Hex slotted nut |
| 4 Cap screw         | 14 Jam nut        | 24 Valve sleeve    |
| 5 Lock washer       | 15 Yoke           | 25 Rubber washer   |
| 6 Link lever, L. H. | 16 Intake chamber | 26 Washer          |
| 7 Link lever, R. H. | 17 Cap screw      | 27 Beveled washer  |
| 8 Pin               | 18 Lock washer    | 28 Valve washer    |
| 9 Jam nut           | 19 Diaphragm      | 29 "O" ring        |
| 10 Taper pin        | 20 Gasket         | 30 Valve body      |

Figure 51. FREEWAY VALVE ASSEMBLY

(2) Start the engine, fill the water tank (17), actuate the freeway valve (16) operating control lever (18, Fig. 32), and test system for proper operation of components and correct amounts of water discharge into the mixer drum.

#### 148. FREEWAY VALVE ASSEMBLY

##### a. Removal (Fig. 50).

(1) Loosen coupling (5, Fig. 48) and shaft (11, Fig. 48) from the freeway valve assembly (16, Fig. 50).

(2) Remove nuts (1 and 8) and withdraw the freeway valve and its piping as an assembly. Unscrew the piping components in their index number sequence from the valve assembly.

##### b. Disassembly (Fig. 51).

(1) Remove nuts (3 and 9), pin (8), tap out taper pin (10), and withdraw levers (11) and link levers (6 and 7).

(2) Unscrew jam nuts (14) and remove yoke (15) from the upper end of valve stem (21). Remove keys (12) and tap out plunger shaft (13).

(3) Remove cap screws (17) and separate the intake chamber (16), diaphragm (19), and valve body (30). Lift out the assembled valve stem.

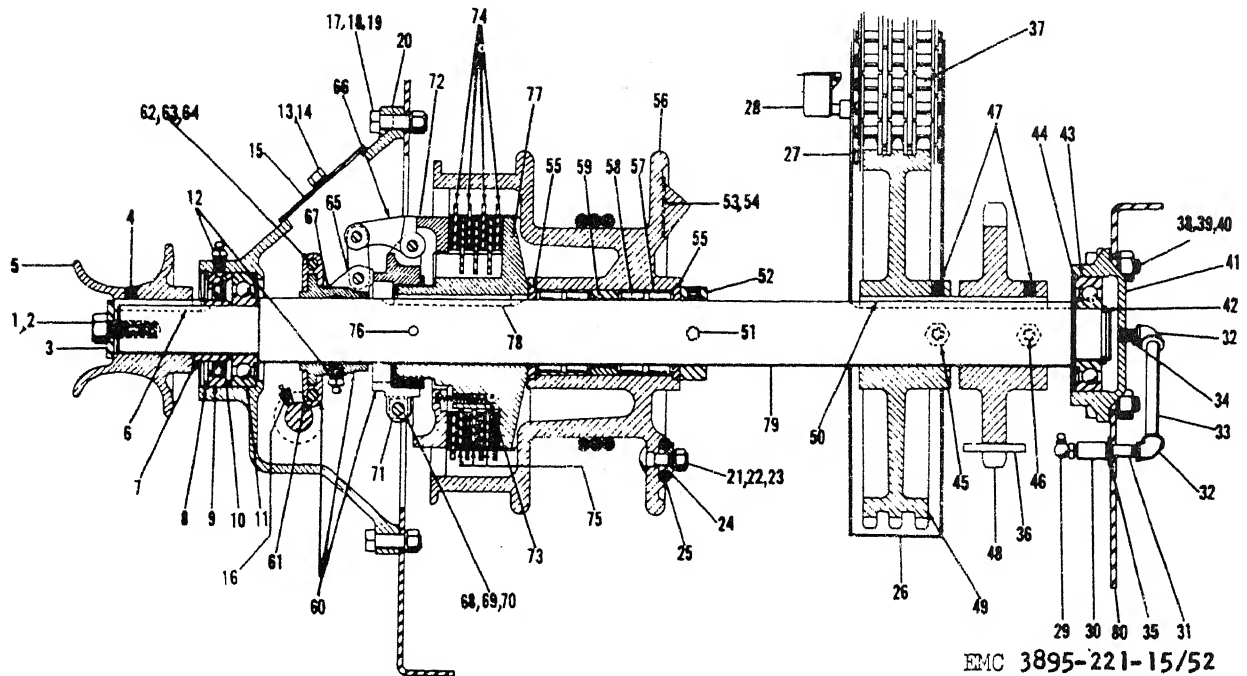
(4) Remove cotter pin (22), nut (23), and slide off valve washer (28), rubber washer (27), metal washer (26), rubber washer (25), and valve sleeve (24) from the lower end of the valve stem (21).

(5) Carefully pry out "O" ring (29) from its seat, and screw out lubrication fittings (1 and 2).

Cleaning and Repair.

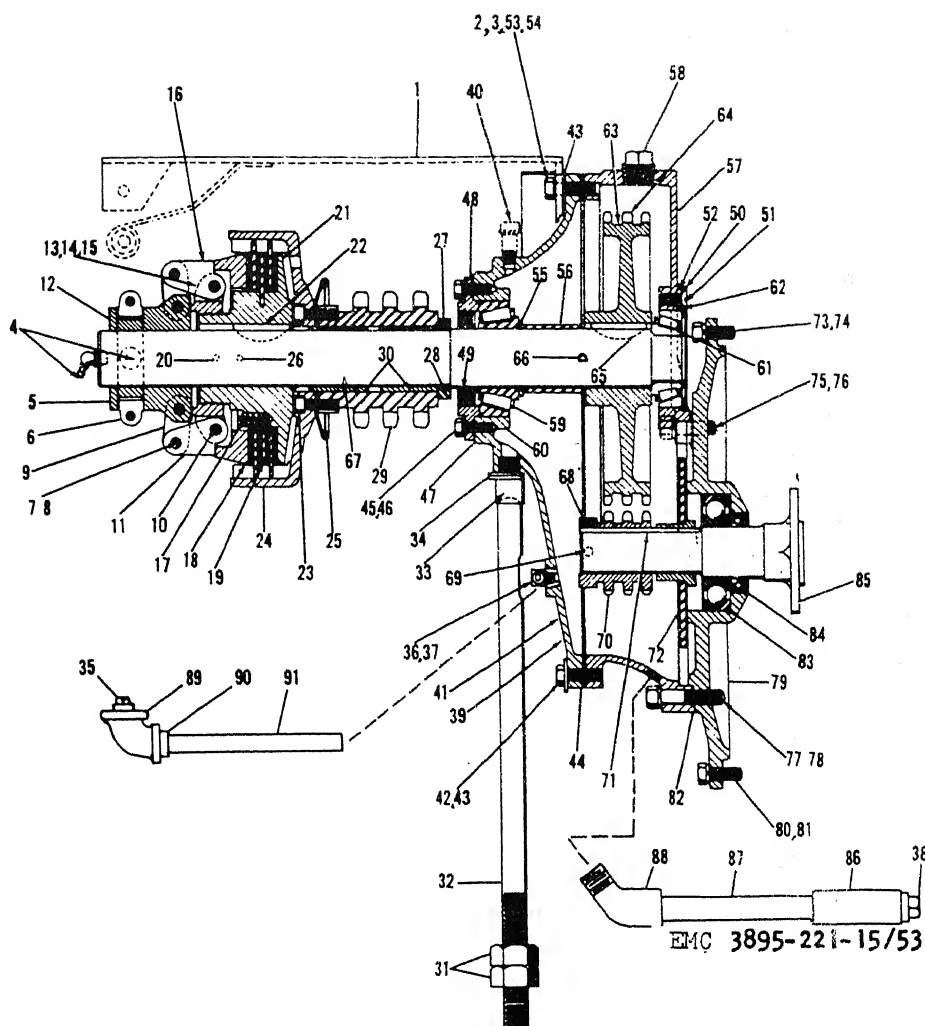
(1) Discard all rubber components; wash all remaining parts in an approved cleaning solvent and dry thoroughly.

(2) Test straightness of valve stem by rolling it on a perfectly level surface; discard it if out-of-round, or if its threaded areas are damaged. Discard all unserviceable parts and replace them with new parts having the same part number.



- |                          |                             |                            |
|--------------------------|-----------------------------|----------------------------|
| 1 Cap screw              | 27 Chain guard (top)        | 54 Self-tapping screw      |
| 2 Lock washer            | 28 Oil cup                  | 55 Thrust washer           |
| 3 Flat washer            | 29 Lube fitting             | 56 Skip hoisting drum      |
| 4 Set screw              | 30 Pipe coupling            | 57 Outer bearing race      |
| 5 Winching head          | 31 Nipple                   | 58 Bearing roller assembly |
| 6 Straight key           | 32 Elbow                    | 59 Bearing spacer          |
| 7 Spacer                 | 33 Nipple                   | 60 Clutch spool assembly   |
| 8 Snap ring              | 34 Close nipple             | 61 Shifter collar assembly |
| 9 Seal retainer          | 35 Flat washer              | 62 Cotter pin              |
| 10 Grease seal           | 36 Drum drive chain         | 63 Flat washer             |
| 11 Ball bearing          | 37 Countershaft drive chain | 64 Pivot pin               |
| 12 Lube fitting          | 38 Hex nut                  | 65 Toggle link             |
| 13 Cap screw             | 39 Cap screw                | 66 Clutch finger           |
| 14 Lock washer           | 40 Lock washer              | 67 Clutch spool            |
| 15 Cover plate           | 41 Rear bearing housing     | 68 Square nut              |
| 16 Lube fitting          | 42 External snap ring       | 69 Lock washer             |
| 17 Hex nut               | 43 Ball bearing             | 70 Cap screw               |
| 18 Lock washer           | 44 Washer                   | 71 Adjusting ring          |
| 19 Machine bolt          | 45 Jam nut                  | 72 Front clutch plate      |
| 20 Front bearing housing | 46 Set screw                | 73 Compression spring      |
| 21 Hex nut               | 47 Set screw                | 74 Driven plate assembly   |
| 22 Carriage bolt         | 48 Drum drive sprocket      | 75 Driving plate           |
| 23 Lock washer           | 49 Driven sprocket          | 76 Master disc pin         |
| 24 Cable clamp           | 50 Straight key             | 77 Master disc             |
| 25 Skip cable            | 51 Set screw                | 78 Straight key            |
| 26 Chain guard (bottom)  | 52 Set collar and screw     | 79 Countershaft            |
|                          | 53 Lubrication plate        |                            |

Figure 52. COUNTERSHAFT ASSEMBLY



- |                         |                     |                         |                      |
|-------------------------|---------------------|-------------------------|----------------------|
| 1 Shifter lever support | 23 Cap screw        | 45 Cap screw            | 65 Woodruff key      |
| 2 Cap screw             | 24 Clutch housing   | 46 Lock washer          | 66 Taper groove pin  |
| 3 Lock washer           | 2 Sheave half       | 47 Plate gasket         | 67 PTO shaft         |
| 4 Lube fitting          | 26 Set screw        | 48 Outer bearing        | 68 Set screw         |
| 5 Clutch spool assy     | 27 Set screw        | retainer plate          | 69 Set screw         |
| 6 Shifting collar assy  | 28 Thrust collar    | 49 Outer oil seal       | 70 Drive sprocket    |
| 7 Cotter pin            | 29 Drive sprocket   | 50 Inner bearing        | 71 Straight key      |
| 8 Rivet pin             | 30 Bushing          | retainer plate          | 72 Oil slinger       |
| 9 Toggle link           | 31 Hex nut          | 51 Cap screw            | 73 Cap screw         |
| 10 Rivet pin            | 32 Support rod      | 52 Bearing cover gasket | 74 Lock washer       |
| 11 Clutch finger        | 33 Rod socket       | 53 Cover dowel pin      | 75 Cap screw         |
| 12 Clutch spool         | 34 Special washer   | 54 Oil instruction tag  | 76 Lock washer       |
| 13 Cap screw            | 35 Pipe plug        | 55 Shaft collar         | 77 Cap screw         |
| 14 Lock washer          | 36 Elbow body       | 56 Shaft spacer         | 78 Lock washer       |
| 15 Adjusting ring       | 37 Face bushing     | 57 PTO housing          | 79 Gear case adapter |
| 16 Front plate          | 38 Pipe plug        | 58 Filler pipe plug     | 80 Cap screw         |
| 17 Compression spring   | 39 PTO housing assy | 59 Bearing cone         | 81 Lock washer       |
| 18 Driven plate assy    | 40 Breather         | 60 Bearing cup          | 82 Adapter gasket    |
| 19 Drive plate          | 41 Housing cover    | 61 Bearing cone         | 83 Shielded bearing  |
| 20 Locking screw        | 42 Cap screw        | 62 Bearing cup          | 84 Oil seal          |
| 21 Master disc          | 43 Flat washer      | 63 Roller chain         | 85 Stub shaft        |
| 22 Woodruff key         | 44 Cover gasket     | 64 Driven sprocket      | 86 Coupling          |
|                         |                     |                         | 87 Nipple            |
|                         |                     |                         | 88 Street elbow      |
|                         |                     |                         | 89 Elbow             |
|                         |                     |                         | 90 Reducer           |
|                         |                     |                         | 91 Nipple            |

Figure 53. POWER-TAKE-OFF SHAFT.

d. Reassembly (Fig. 51).

(1) Install the valve sleeve (24), washers (25, 26, 27 and 28) in that order over the lower end (smallest diameter) of the valve stem (21) and secure snugly up to the stem shoulder with nut (23) and cotter pin (22).

(2) Place this valve stem assembly into the valve body (30) so that it is seated evenly. Position a gasket (20), the bronze diaphragm (19), and the remaining gasket (20) over the upper end of the stem so that all holes are aligned, and then secure the intake chamber (16) onto the body with cap screws (17).

(3) Press the plunger shaft (13) through the chamber hole, install keys (12), link levers (6 and 7), tap in taper pins (10), secure levers (11) to the link levers with pins (8) and nuts (9).

(4) Screw one nut (14) down the threaded end of the stem, install the yoke (15) over the stem end and into the link lever holes, and screw on remaining jam nut (14). The link levers should be in the down position (near vertical); turn the upper jam nut (14) down to rest on the yoke, and turn the lower jam nut (14) up tightly against the yoke.

NOTE: If leakage is noticed from the freeway valve into the mixer drum after the valve is in operation, correct this situation by lowering the two jam nuts (14) slightly with the valve set at drum discharge. Test by closing the valve. Repeat procedure until leakage stops.

e. Installation (Fig. 50).

(1) Screw nipple (15) into freeway valve assembly (16), nozzle (14) onto nipple (15), nipple (7) into the valve, elbow (6) onto nipple (7), and the flanged pipe (4) into elbow (6).

(2) Position the assembled freeway valve assembly and piping in its approximate mounted location and secure finger tight with "U" bolt (9), bars (12 and 13), and nuts (8). Insert a new gasket (5) between the water tank assembly (17) flange and the flanged pipe (4) and secure with the attaching parts.

(3) Connect the freeway valve to the operating shaft (11, Fig. 48) with coupling (5, Fig. 48).

(4) Fill the water tank (17, Fig. 50) and test freeway valve for proper operation by actuating valve control lever.

149. P.T.O. AND COUNTERSHAFTS

a. Removal and Disassembly. Removal and disassembly is complete upon removing the items of Figures 52 and 53 in their numerical sequence.

b. Cleaning and Repair. Wash all parts in an approved solvent and wipe dry. Discard all damaged parts.

c. Reassembly and Installation. Reassembly and installation is complete upon assembling the items of Figures 52 and 53 in reverse order of the numerical sequence.

Section VIII. MIXER TRAILER GROUP

150. DESCRIPTION

The concrete mixer trailer group consists of the mixer frame components (Fig. 46), wheel and hub assemblies (Fig. 56), front and rear axles (Figs. 54 and 57). These combined assemblies provide a means of supporting and retaining the mixer in a stationary position during the operation of mixing concrete, and also to allow it to be mobile during transportation from one place to another. When the mixer is positioned and ready for operation, all four stabilizer legs are manually lowered to the ground surface to keep the mixer immobile and to relieve the tires of the mixture weight as it is added to the drum.

151. TOWING POLE

The towing pole (4, Fig. 54) consists of a pole and eye weldment which is inserted and secured to a sleeve (8) and hinge weldment. Removal and disassembly is complete upon removing pivot pin (7) and bolt (1). No adjustment or service of the towing pole is ever required; repair, if any, is limited to replacement of parts.

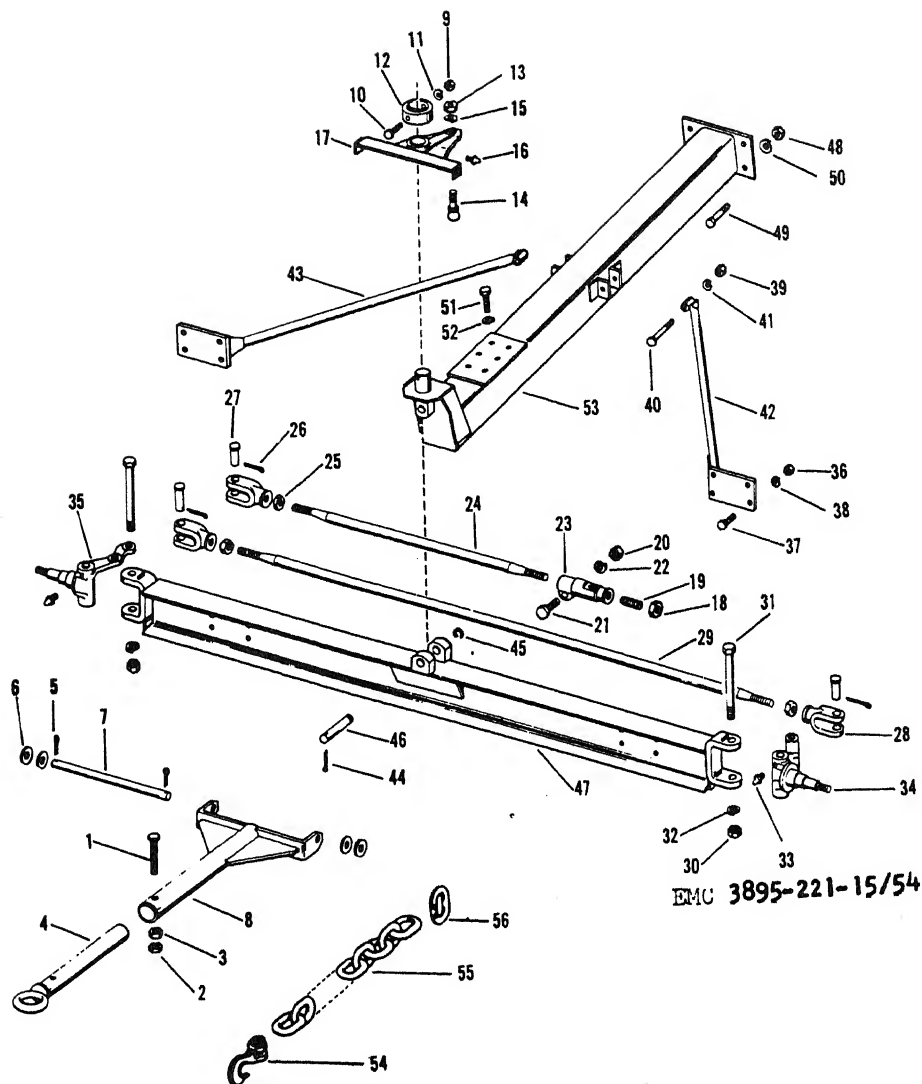
152. STEERING COMPONENTS

a. Wheel Toe-in Adjustment.

(1) The front wheels require 1/8 inch "toe-in" allowance for proper trailering action of the mixer. Toe-in may be checked and accomplished as follows:

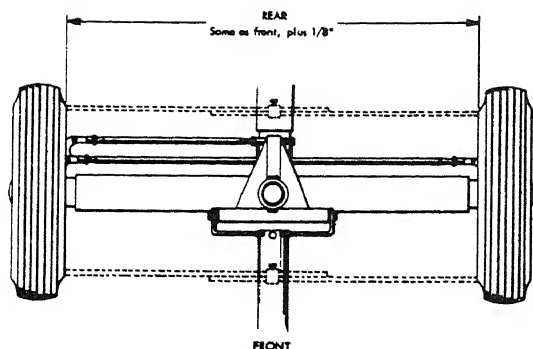
(2) With the towing pole and wheels pointed straight ahead, and using two flat rods and a suitable clamp, measure the distance between the two front tires at hub height and forward of the axle. The ends of the two rods should contact the tires at the highest point on the tire wall, and just snug enough to bind, but not to indent the tire wall (see Fig. 55). Tighten clamp securely.

(3) Withdraw the measuring device from the wheels carefully so as not to alter the overall length. Position the rods rearward of the front tires, at hub height, and note the difference in length. With the ends of the rods contacting corresponding points on the rear as they did on front of the front tires, there should be approximately



- |                  |                  |                        |                       |
|------------------|------------------|------------------------|-----------------------|
| 1 Bolt           | 15 Lock washer   | 29 Tie rod             | 43 Reach rod, R. H.   |
| 2 Jam nut        | 16 Lube fitting  | 30 Hex nut             | 44 Cotter pin         |
| 3 Hex nut        | 17 Steering yoke | 31 King pin            | 45 Snap ring          |
| 4 Towing pole    | 18 Jam nut       | 32 Lock washer         | 46 Pivot pin          |
| 5 Cotter pin     | 19 Set screw     | 33 Lube fitting        | 47 Front axle         |
| 6 Plain washer   | 20 Hex nut       | 34 Axle spindle, L. H. | 48 Hex nut            |
| 7 Pivot pin      | 21 Cap screw     | 35 Axle spindle, R. H. | 49 Machine bolt       |
| 8 Pole sleeve    | 22 Lock washer   | 36 Hex nut             | 50 Lock washer        |
| 9 Hex nut        | 23 Ball socket   | 37 Cap screw           | 51 Cap screw          |
| 10 Cap screw     | 24 Drag rod      | 38 Lock washer         | 52 Lock washer        |
| 11 Lock washer   | 25 Jam nut       | 39 Hex nut             | 53 Front axle support |
| 12 Yoke collar   | 26 Cotter pin    | 40 Machine bolt        | 54 Grab hook          |
| 13 Hex nut       | 27 Rivet pin     | 41 Lock washer         | 55 Safety chain       |
| 14 Steering ball | 28 Rod end       | 42 Reach rod, L. H.    | 56 Missing link       |

Figure 54. FRONT AXLE COMPONENTS.



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Figure 55. TOE-IN ADJUSTMENT.

1/8 inch gap from the end of the rod to the tire. This amount was factory pre-set and must be maintained. See Figure 55

(4) If the amount is not 1/8 inch, loosen nut (25, Fig. 54) and turn drag rod (24) rod end (28) in or out as necessary. One-half turn results in 1/8 inch adjustment. Rotating the yoke end in a clockwise direction shortens the distance between the rear of the front tires; counterclockwise rotation lengthens the distance.

b. Steering Adjustment.

(1) Position the mixer on a smooth and level surface, with the towing pole pointed straight ahead (perpendicular to the front axle.)

(2) See Figure 54. Measure the distance from the center of the king pin (31) on each side of the front axle (47) to a center point punched onto the eye of the towing pole. If the drag rod (24) is perfectly parallel with the front axle, the distances from the spindle bolts to the towing pole eye will be identical.

(3) If the distances are not identical, remove the cotter pin (26) and rivet pin (27) from the rod end (28). Loosen nut (25), and turn the rod end in either direction until identical distances are measured at the points stated. Connect the rod end (28) to its anchor bracket hole with rivet pin (27) and cotter pin (26); tighten the jam nut (25) securely, and re-check the measurements.

### 153. WHEELS AND TIRES

a. Removal and Disassembly. Disassemble the wheels and tires in the numerical sequence of Figure 56.

b. Cleaning and Inspection.

(1) Wash the tire and tube with soap and water; rinse with jets of clear water.

(2) Inspect the tire and tube for wear, deterioration, and punctures. Inflate the tube, submerge the tube in a water tank and observe for bubbles which indicate air leaks in the tube. Repair small leaks in the tube with patches, install new valve stems if leakage is located at that point, or discard a tire or tube that is no longer serviceable.

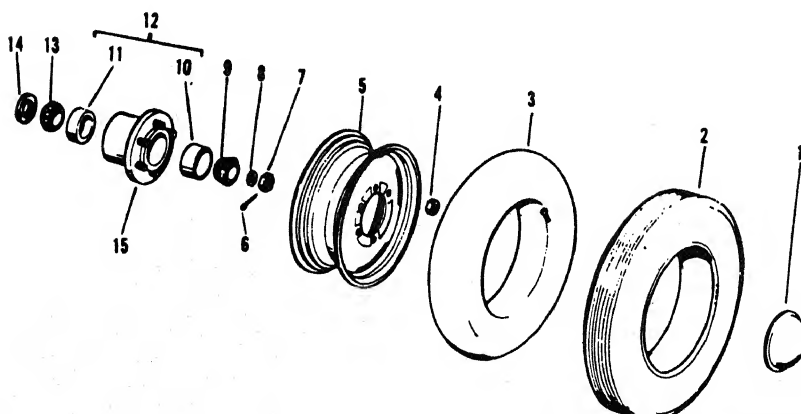
(3) Remove all abrasive particles, stones, etc. from exterior of tires. Be sure tires and tubes are free of oil and grease.

c. Reassembly. Reassemble in the reverse order of index number sequence of Figure 56. Inflate tires to 40 pounds.

### 154. REAR AXLE.

a. Disassembly and Reassembly. Accomplish these procedures by following the index number sequence of Figure 57.

b. Repair. Discard all damaged parts and install new parts of the same part number.



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Figure 56. WHEELS AND TIRES.



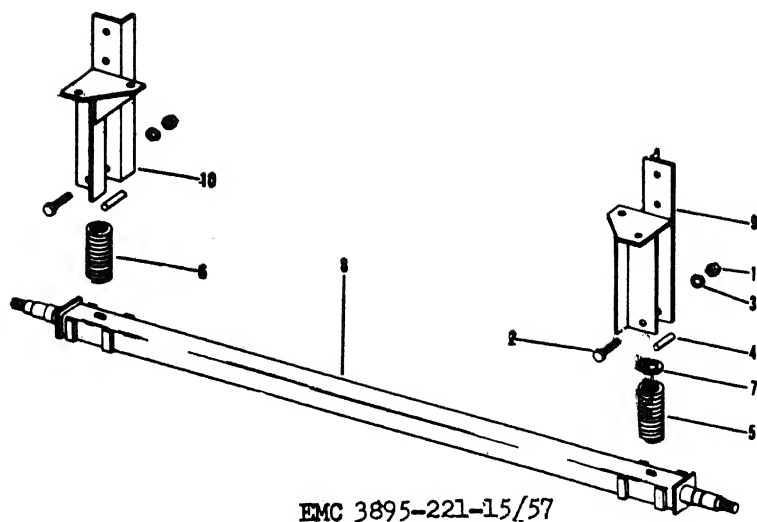


Figure 57. REAR AXLE COMPONENTS.

- 1 Hex nut
- 2 Cap screw
- 3 Lock washer
- 4 Pipe spacer
- 5 Axle spring, L. H.
- 6 Axle spring, R. H.
- 7 Spring collar
- 8 Rear axle
- 9 Axle bracket
- 10 Axle bracket

## CHAPTER 5

### DEMOLITION, SHIPMENT AND LIMITED STORAGE

#### Section 1. DEMOLITION OF THE MIXER TO PREVENT ENEMY USE.

##### 155. GENERAL.

When capture or abandonment of the concrete mixer to an enemy is imminent, the responsible unit commander must make the decision either to destroy the equipment or to render it inoperative. Based on this decision, orders are issued which cover the desired extent of destruction. Whatever method of demolition is employed, it is essential to destroy the same vital parts of all mixers and all corresponding repair parts.

##### 156. DEMOLITION TO RENDER THE MIXER INOPERATIVE.

a. Demolition by Mechanical Means. Use sledge hammers, crowbars, picks, axes, or any other heavy tools which may be available to destroy the following:

- (1) Engine block and manifold.
- (2) Carburetor, magneto, governor, and water pump.
- (3) Radiator, starter motor, and generator.
- (4) Mixer drum assembly.
- (5) Skip.

b. Misuse. Perform the following steps to render the mixer inoperative.

- (1) Drain oil from engine crankcase. Pour sand in oil filler openings.
- (2) Start the engine and allow it to run until it fails.

##### 157. DEMOLITION BY EXPLOSIVES OR WEAPONS' FIRE.

a. Explosives. Place as many of the following charges as the situation permits and detonate them simultaneously with detonating cord and a suitable detonator.

(1) One 1/2 pound charge between generator and engine block.

(2) One 1/2 pound charge between starter and engine block.

(3) One 1/2 pound charge on countershaft.

(4) One 1/2 pound charge on skip and drum.

b. Weapon's Fire. Fire on the mixer with the heaviest suitable weapon available. Direct fire at engine drum.

##### 158. OTHER DEMOLITION METHODS.

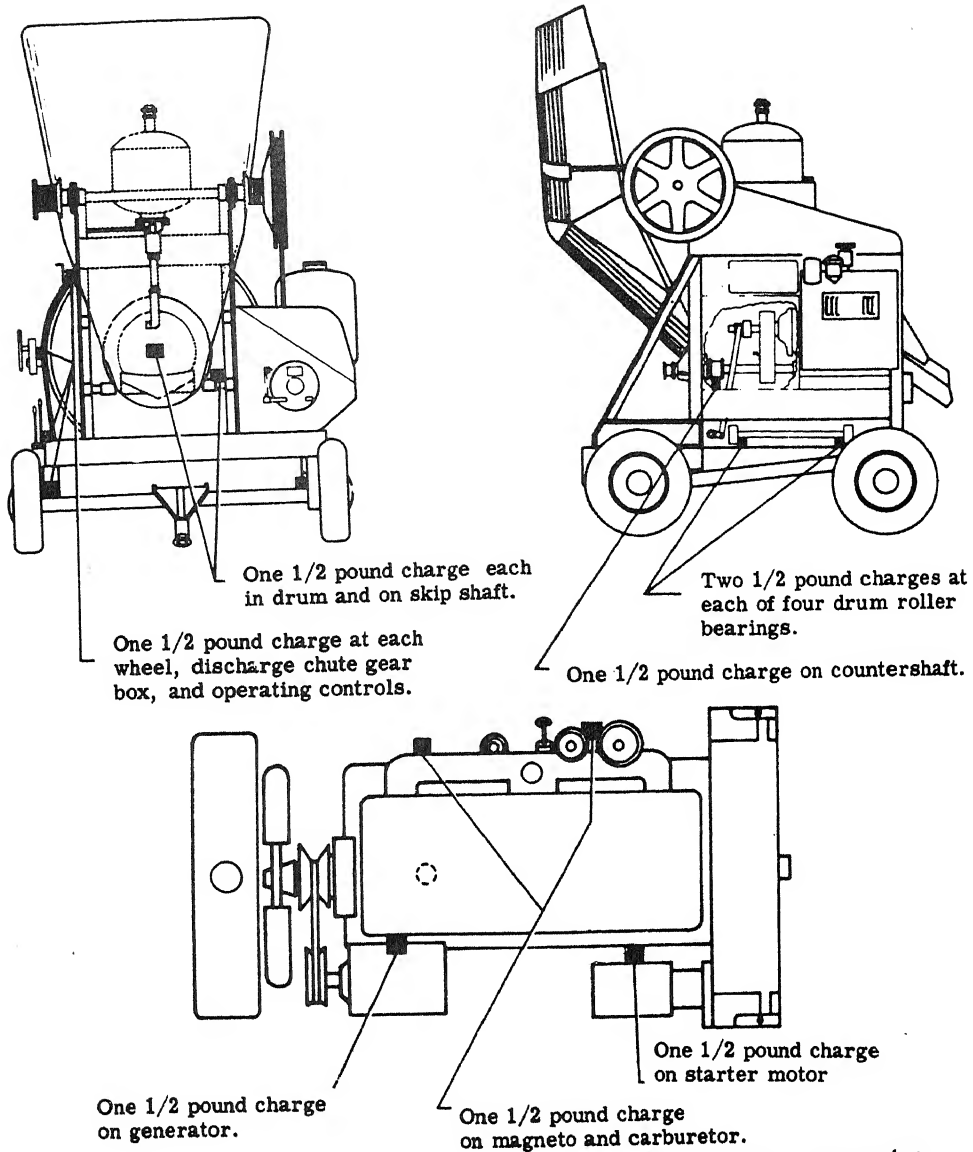
a. Scattering and Concealment. Remove all easily accessible parts such as carburetor, generator, starter, and magneto, and scatter them through dense foliage, bury them in dirt or sand, or throw them in a lake, stream, well or other body of water.

b. Burning. Pack rags, clothing, or canvas under and around engine and drive units. Saturate this packing with gasoline, oil or diesel fuel and ignite it.

c. Submersion. Submerge the unit in a body of water to provide water damage and concealment. Salt water does greater damage to metal parts than fresh water.

##### 159. TRAINING

All operators should receive thorough training in the destruction of the mixer. Refer to FM 5-25. Simulated destruction, using all of the methods listed above, should be included in the operator training program. It must be emphasized in training, that demolition operations are usually necessitated by critical situations when time available for carrying out destruction is limited. For this reason, it is necessary that operators be thoroughly familiar with all methods of destruction of equipment, and be able to carry out demolition instructions without reference to this or any other manual.



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Figure 58. PLACEMENT OF DEMOLITION CHARGES

## Section II. SHIPMENT AND LIMITED STORAGE

### 160. PREPARATION OF EQUIPMENT FOR SHIPMENT.

a. Detailed instructions for the preparation of the mixer for domestic shipment are outlined within this paragraph. Preservation will be accomplished in sequence that will not require the operation of previously preserved components

b. The mixer will be inspected for any unusual condition such as damage, rusting, accumulation of water, and pilferage. Da Form 464, (Work Sheet for Preventive Maintenance and Technical Inspection of Engineer Equipment), will be executed for the mixer.

c. The mixer shall be cleaned and dried by an approved method. Approved methods are outlined in TM 38-230.

d. Paint all surfaces when the paint has been removed or damaged. Refer to TB ENG 60 for detailed instructions in cleaning the mixer for and the application of paint.

e. Prepare a DA Form 2258 (Depreservation Guide of Engineer Equipment) for the mixer as outlined in TB ENG 60.

f. Check the coolant in the cooling system to assure it is clean and checks to a  $-25^{\circ}\text{F}$ . If solution is contaminated, the system will be drained, cleaned, and refilled with the proper mixture of 50 percent water and 50 percent ethylene glycol conforming to Specification O-A-548, type 1, as outlined in TB ENG 60.

NOTE: It is not necessary to drain the cooling system if the solution is clean. If the level of the solution is low, undiluted antifreeze conforming to Specification O-A-548, type 1, may be added. Except if temperatures below a  $-25^{\circ}\text{F}$  are expected, the system will be drained and filled with antifreeze conforming to Specification MIL-C-11755 in its undiluted condition.

g. Remove the engine air cleaner and drain the oil. Clean the air cleaner thoroughly. Install the empty air cleaner and seal all the openings of the air cleaner that may permit the direct entry of water, with pressure-sensitive tape type III, class I, conforming to Specification PPP-T-60.

h. The mixer will be marked in accordance with MIL-STD-129 for shipping.

### 161. LOADING EQUIPMENT FOR SHIPMENT

a. Loading instructions for the mixer are similar to those provided for unloading.

b. The best method is by overhead crane, if one is available. Lifting slings will be installed as outlined in paragraph 7c.

c. Block mixer securely, front and back of each wheel, and tie down to bed of carrier securely, using tie down eyes provided.

### 162. PREPARATION OF EQUIPMENT FOR STORAGE

a. Detailed instruction for preserving and maintaining the mixer in limited Storage are outlined within this paragraph. Refer to AR 743-505.

b. The mixer will be inspected as outlined in paragraph 160b.

c. The mixer will be cleaned and dried as outlined in paragraph 160c.

d. The mixer will be painted as outlined in paragraph 160d.

e. Depreservation instructions will be provided as outlined in paragraph 160e.

f. The cooling system will be protected as outlined in paragraph 160f.

g. The engine Air Cleaner will not be drained or removed for limited storage.

h. Tires will be inflated to their proper pressure while standing in storage under load. If the mixer is blocked up, tires will be deflated to two-thirds normal tire pressure.

i. If suitable shelter is not available, position the mixer on heavy planking or other solid surface. Cover with a tarpaulin or other waterproof covering and tie down securely.

### 163. INSPECTION AND MAINTENANCE OF EQUIPMENT IN STORAGE

a. Inspection. When equipment has been placed in storage, all scheduled preventive maintenance services, including inspection, will be suspended, and preventive maintenance inspection will be performed as specified herein. Refer to AR 743-505.

b. Worksheet and preventive Maintenance. DA Form 464 will be executed on each major item of equipment when equipment is initially placed in limited storage and every 90 days thereafter. Required maintenance will be performed promptly to insure that the equipment is mechanically sound and ready for immediate use.

c. Operation. Equipment in limited storage must be operated long enough to bring it up to operating temperature and for complete lubrication of all bearings, gears, and so on, at least every 90 days. Equipment must be serviced and in satisfactory operating condition before it is operated.

## APPENDIX I

### REFERENCES

1. **DICTIONARIES OF TERMS AND ABBREVIATIONS**
  - AR 320-5 Dictionary of United States Army Terms
  - AR 320-50 Authorized Abbreviations and Brevity Codes
2. **FIRE PROTECTION**
  - TM 5-687 Repairs and Utilities: Fire Protection Equipment and Appliances; Inspections, Operations, and Preventive Maintenance
  - TM 9-1799 Ordnance Maintenance: Fire Extinguishers
3. **LUBRICATION**
  - LO 5-3895-221-15 Lubrication Order
  - SM 10-1-C4-1 Petroleum, Petroleum-Base Products, and Related Material
4. **PAINTING AND PRESERVATION**
  - TB ENG 60 Preservation and Painting of Serviceable Corps of Engineers Equipment
  - TM 38-230 Preservation, Packaging, and Packing of Military Supplies and Equipment
5. **PREVENTIVE MAINTENANCE**
  - AR 750-5 Maintenance Responsibilities and Shop Operation
  - TM 5-505 Maintenance of Engineer Equipment
  - TM 9-1870-1 Care and Maintenance of Pneumatic Tires
  - TM 9-6140-200-15 Storage Batteries, Lead-Acid Type
6. **PUBLICATION INDEXES**
  - DA Pam 108-1 Index of Army Motion Pictures, Film Strips, Slides, and Phono-Recordings
  - DA Pam 310-1 Index of Administrative Publications
  - DA Pam 310-2 Index of Blank Forms
  - DA Pam 310-3 Index of Training Publications
  - DA Pam 310-4 Index of Technical Manuals, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders
  - DA Pam 310-5 Index of Graphic Training Aids and Devices
  - DA Pam 310-25 Index of Supply Manuals-Corps of Engineers
7. **RADIO INTERFERENCE SUPPRESSION**
  - TM 11-483 Radio Interference Suppression
8. **SHIPMENT AND LIMITED STORAGE**
  - AR 743-505 Storage of Supplies and Equipment, Limited Storage of Engineers Mechanical Equipment
9. **SUPPLY PUBLICATIONS**
  - TM 5-3895-221-20P Organizational Repair Parts
  - TM 5-3895-221-35P Field and Depot Repair Parts
10. **TRAINING AIDS**
  - FM 5-25 Explosives and Demolitions
  - FM 21-5 Military Training
  - FM 21-6 Techniques of Military Instruction
  - FM 21-30 Military Symbols
11. **UNSATISFACTORY EQUIPMENT REPORT**
  - AR 700-38 Unsatisfactory Equipment Report

APPENDIX II  
MAINTENANCE ALLOCATION CHART

1. GENERAL

The Maintenance Allocation Chart lists all maintenance and repair functions authorized the various echelons.

2. MAINTENANCE

Maintenance is any action taken to keep materiel in a serviceable condition or to restore it to serviceability when it is unserviceable. Maintenance of materiel includes the following:

a. Service. To clean, preserve, and replenish fuel and lubricants.

b. Adjust. To regulate periodically to prevent malfunction.

c. Inspect. To verify serviceability and detect incipient electrical or mechanical failure by scrutiny.

d. Test. To verify serviceability and detect incipient electrical or mechanical failure by use of special equipment such as gages, meters, and the like.

e. Replace. To substitute serviceable assemblies, subassemblies, and parts for unserviceable components.

f. Repair. To restore an item to serviceable condition through correction of a specific failure or unserviceable condition. This function includes, but is not limited to, inspecting, cleaning, preserving, adjusting, replacing, welding, riveting, and straightening.

g. Aline. To adjust two or more components of an electrical system so that their functions are properly synchronized.

h. Calibrate. To determine, check, or rectify the graduation of an instrument, weapon or weapons system, or components of a weapons system.

i. Overhaul. To restore an item to completely serviceable condition as prescribed by serviceability standards developed and published by heads of technical services. This is accomplished through employment of the technique of "Inspect and Repair Only as Necessary" (IROAN). Maximum utilization of diagnostic and test equipment is combined with minimum disassembly of the item during the overhaul process.

3. EXPLANATION OF COLUMNS

a. Functional Group. The functional group is a numerical group set up on a functional basis. The applicable Functional Grouping Indexes (obtained from the Corps of Engineers Functional Grouping Indexes) are listed on the maintenance allocation chart in the appropriate numerical sequence. These indexes are normally set up in accordance with their function and proximity to each other.

b. Components and Related Operation. This column contains the Functional Grouping Index heading, subgroup headings, and a brief description of the part starting with the noun name. It also designates the operations to be performed such as service, adjust, inspect, test, replace, repair, and overhaul.

c. Echelons of Maintenance. This column contains the various echelons of maintenance by number designation. An "X" in the appropriate echelon column in line with an indicated maintenance function authorizes that echelon to perform the function. The "X" indicates the lowest echelon responsible for performing the function, but does not necessarily indicate repair parts stockage at that level. Higher echelons are authorized to perform the indicated functions of lower echelons.

d. Remarks. This column lists specific maintenance functions, special tools, cross-references, instructions, and the like pertinent to the operation being performed.

# MAINTENANCE ALLOCATION CHART

Functional group	Components and related operation	Echelons of maintenance					Remarks
		1	2	3	4	5	
01	<b>ENGINE</b>						
0100	<b>ENGINE ASSEMBLY</b>						
	Engine Assembly						
	Service.....	X					
	Inspect.....	X					
	Test.....		X				
	Replace.....			X			
	Repair.....		X				
	Overhaul.....				X		
0101	<b>CRANKCASE, BLOCK, CYLINDER HEAD</b>						
	Block Assembly						
	Replace.....				X		
	Repair.....			X			
	Cylinder Head						
	Replace.....		X				
0103	<b>CRANKSHAFT</b>						
	Crankshaft; Bearings; Seals						
	Replace.....				X		
	Pulley						
	Replace.....		X				
0103	<b>FLYWHEEL ASSEMBLY</b>						
	Flywheel; Ring Gear; Housing						
	Replace.....			X			
0104	<b>PISTONS, CONNECTING RODS</b>						
	Pistons; Rings; Pins and Bearings						
	Replace.....				X		
	Rod, Connecting						
	Replace.....				X		
	Repair.....				X		
0105.1	<b>VALVES</b>						
	Guides; Springs; Locks						
	Replace.....			X			
	Valves and Seats						
	Replace.....			X			
	Repair.....			X			
0105.2	<b>ROCKER ARMS, TAPPETS</b>						
	Tappets						
	Adjust.....		X				
	Replace.....				X		
	Guides						
	Replace.....				X		
	Cover						
	Replace.....		X				
0105.8	<b>CAMSHAFTS</b>						
	Camshaft and Bearings						
	Replace.....				X		
0105.5	<b>TIMING GEARS</b>						
	Gears and Cover						
	Replace.....				X		
0106.1	<b>OIP PUMP</b>						
	Pump, Oil						
	Replace.....			X			
	Repair.....			X			

Functional group	Components and related operation	Echelons of maintenance					Remarks
		1	2	3	4	5	
0106.2	OIL FILTERS Oil Filter Assembly Service----- Replace-----	X	X				
0106.4	PRESSURE REGULATOR OR RELIEF VALVES Plunger; Spring; Adjusting Screw Replace-----		X				
0106.5	CRANKCASE VENTILATION Breather Service----- Replace-----	X	X				
0106.6	OIL PAN, LINES, LEVEL GAGE Oil Pan Replace----- Lines; Fittings Replace----- Repair----- Level Gage Replace-----	X	X	X			
0108	MANIFOLDS Manifold Replace-----		X				
0111.1	HAND CRANKING DEVICES Crank, Hand Replace-----	X					
03	FUEL SYSTEM						
0301	CARBURETOR; FUEL INJECTOR Carburetor Adjust----- Replace----- Gasket, Bowl Replace-----	X	X				
0302.4	FUEL PUMP, GASOLINE Pump, Fuel Replace-----		X				
0304	AIR CLEANER Air Cleaner Assembly Service----- Replace-----	X	X				
0306	TANKS, LINES, FITTINGS Tank, Fuel Service----- Inspect----- Replace----- Repair----- Cap, Tank; Fittings; Valves; Hoses Replace-----	X X	X	X			
0308	ENGINE SPEED GOVERNOR Governor Assembly Replace----- Repair-----		X				
0308.4	GOVERNOR CONTROLS Lever and Linkage Replace-----		X	X			



Functional group	Components and related operation	Echelons of maintenance					Remarks
		1	2	3	4	5	
0309	FUEL FILTERS						
	Filter, Fuel						
	Service.....	X					
	Replace.....		X				
	Bowl and Gasket						
0312	Replace.....	X					
	ACCELERATOR, THROTTLE OR CHOKE CONTROLS						
	Controls, Choke						
	Replace.....		X				
04	EXHAUST SYSTEM						
0401	MUFFLER AND PIPES						
	Muffler and Pipes						
	Replace.....		X				
05	COOLING SYSTEM						
0501	RADIATOR						
	Radiator						
	Service.....	X					
	Inspect.....	X					
	Replace.....		X				
	Repair.....			X			
	Cap, Radiator						
	Replace.....	X					
	Shell and Grille						
	Replace.....		X				
0503	Lines and Fittings, Hoses, Pipes, Clamps						
	Hoses, Pipes and Clamps						
	Replace.....		X				
0504	WATER PUMP						
	Pump, Water						
	Replace.....		X				
	Repair.....			X			Install kit
0505	FAN ASSEMBLY						
	Belts, Fan						
	Adjust.....	X					
	Replace.....		X				
	Fan; Pulley; Guards						
	Replace.....		X				
0506	WATER MANIFOLDS, HEADERS, THERMOSTATS AND HOUSING, GASKETS						
	Thermostat						
	Test.....		X				
	Replace.....		X				
	Housing						
	Replace.....		X				
06	ELECTRICAL SYSTEM (ENGINE AND VEHICULAR						
0601	GENERATOR						
	Generator						
	Test.....		X				
	Replace.....		X				
	Repair.....			X			
	Brushes						
	Replace.....		X				

Functional group	Components and related operation	Echelons of maintenance					Remarks
		1	2	3	4	5	
0602	GENERATOR REGULATOR Regulator, Generator Adjust..... Test..... Replace.....		X X X				
0603	STARTER Starter Test..... Replace..... Repair..... Brushes and Solenoid Replace.....		X X	X			
0604.2	MAGNETO Magnet Service..... Adjust..... Replace..... Repair..... Points and Capacitor Replace.....		X X X	X			
0604.6	IGNITION COIL: WIRING, SPARK PLUGS Spark Plugs Service..... Adjust..... Test..... Replace..... Wiring Replace.....		X X X X				
0607	INSTRUMENT OR ENGINE CONTROL PANEL Switches; Gages; Panel Lights Replace..... Wiring Replace..... Repair..... Bulb Replace.....		X X X				
0608	MISCELLANEOUS ITEMS Slave Receptacle Replace..... Repair.....	X	X X				
0612	BATTERIES Batteries Service..... Test..... Replace..... Cables Replace..... Repair..... Box, Battery Replace.....	X	X X				
08 0800	POWER TRANSFER POWER TRANSFER ASSEMBLY Power Transfer Assembly Service..... Replace..... Repair.....	X		X X			

Functional group	Components and related operation	Echelons of maintenance					Remarks
		1	2	3	4	5	
0801	TRANSFER CASE Housing Replace.....			X			
0802.1	INPUT SHAFT Bearings; Seals, Shaft; Gear Replace.....			X			
0802.6	OUTPUT SHAFT; MAIN SHAFT Bearings; Seals; Shaft; Gear Replace.....			X			
0803	CLUTCH Clutch Assembly Service..... Adjust..... Replace..... Repair.....						
0803.1	CLUTCH CONTROLS Control, Clutch Replace.....		X				
0806.7	VENTILATION, BREATHERS Breather Assembly Replace.....		X				
10	FRONT AXLE						
1000	FRONT AXLE ASSEMBLY Axle Assembly, Front Service..... Replace..... Repair.....	X					
1001.1	AXLE AND TONGUE, HOUSING, DRAWBAR, LUNETTE Axle; Tongue; Lunette Replace.....		X				
1004	STEERING Spindle; Draglink; Tie Rod Replace.....		X				
11	REAR AXLE						
1100	REAR AXLE ASSEMBLY Axle Assembly, Rear Replace..... Repair.....		X				
13	WHEELS AND TRACKS						
1311	WHEEL ASSEMBLY Wheel Assembly Service..... Replace..... Repair.....		X				
1313	TIRES, TUBES Tires Service..... Replace..... Tubes Replace..... Repair.....	X	X				
15	FRAME						
1501	FRAME ASSEMBLY Frame, Mixer Replace..... Tie Angles; Tie Plate Replace.....		X	X			

Functional group	Components and related operation	Echelons of maintenance					Remarks
		1	2	3	4	5	
1507	LANDING GEAR; LEVELING JACKS (MECHANICAL OR HYDRAULIC) Stabilizer Legs Replace		X				
1513	SPRINGS AND SHOCK ABSORBERS REAR SPRINGS Spring, Helical Replace		X				
1513	BODY; CAB; HOOD; HULL DOORS; HATCHES; HOOD Doors; Hood Replace		X				
1504	PANELS Panels Replace		X				
1508	PACKS, BOXES, STRAPS Box Replace		X				
22	MISCELLANEOUS BODY, CHASSIS OR HULL, AND ACCESSORY ITEMS DATA PLATES AND INSTRUCTION HOLDERS Plates, Data Replace						
2210	PLATES, CAUTION AND INSTRUCTION Replace		X				
2602.1	ACCESSORIES, PUBLICATIONS, TEST EQUIPMENT AND TOOLS ACCESSORIES Accessories Replace	X					
2602.2	COMMON TOOLS Tools, Common Replace	X					
2602.4	PUBLICATIONS Publications Replace	X					
47	GAGES (NON-ELECTRICAL); WEIGHING AND MEASURING DEVICES TACHOMETERS Tachometer Replace		X				
4701.2	LIQUID LEVEL GAGES Gages, Liquid Level Replace		X				
55	PUMPS (EXCLUDE ENGINE PUMPS) PUMP ASSEMBLY Pump Assembly Service	X					
5500	Replace		X				
	Repair		X				
5001	VOLUTE, HOUSING Housing, Water Pump Replace		X				
5502	IMPELLER; ROTOR, DIAPHRAGM Bearings; Seals; Impeller; Shaft Replace		X				
		X					

Functional group	Components and related operation	Echelons of maintenance					Remarks
		1	2	3	4	5	
5504.2	SUCTION VALVE, SUCTION HEADS Valves, Check and Priming Replace.....		X				
5508.2	PUMP DRIVE ASSEMBLY Pulley, Pump Drive Replace.....		X				
	Belt Adjust.....	X					
	Replace.....		X				
5512	INLET AND OUTLET COMPONENTS Pipe and Fittings Replace.....		X				
73	CONCRETE AND ASPHALT EQUIPMENT (MIXERS; PAVERS; SPREADERS; FINISHERS, ETC.)						
7301	POWER LOADERS SKIP Power Loader Skip Service.....	X					
	Replace.....		X				
	Repair.....		X				
	Shaft and Pulleys Replace.....		X				
	Drum, Hoist Replace.....			X			
7301.2	CONTROLS Brake and Clutch Assembly Service.....	X					
	Adjust.....	X					
	Replace.....		X				
	Repair.....		X				
7302	DRUMS; MIXER OR DRYER Drum Assembly, Mixer Replace.....			X			
	Repair.....		X				
7302.1	DRUM DRIVES, ROLLERS, SHAFTS AND GEARS Bearings; Shaft; Rollers Service.....	X					
	Replace.....			X			
	Chain, Drive Replace.....		X				
	Repair.....		X				
7304	HOPPERS, GATES, CHUTES Gearbox Assembly Service.....	X					
	Replace.....		X				
	Repair.....		X				
7305	MAIN DRIVE Chains Replace.....		X				
	Countershaft Assembly Replace.....			X			
	Repair.....		X				
7305.2	GUARDS, HOUSINGS, COVERS Covers, Guards, and Plate Replace.....		X				

Functional group	Components and related operation	Echelons of maintenance					Remarks
		1	2	3	4	5	
7313	WATER SYSTEM						Packing
	Tank Assembly, Water						
	Service_____	X					
	Replace_____		X				
	Repair_____		X				
	Valve Assembly, Water						
	Replace_____		X				
	Repair_____		X				
7313.1	MECHANICAL DRIVES, FEEDS AND/OR HAND CONTROLS						
	Chain						
	Replace_____		X				
	Repair_____		X				
	Sprocket and Crank						
	Replace_____		X				
76	FIRE FIGHTING EQUIPMENT						
7603	FIRE EXTINGUISHERS						
	Extinguishers, Fire						
	Service_____	X					
	Replace_____	X					

APPENDIX III  
BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

1. GENERAL

Section II lists the accessories, tools, and publications required in 1st echelon maintenance and operation, initially issued with, or authorized for the concrete mixer, chain belt Model HBG.

2. EXPLANATION OF COLUMNS

a. Source Codes. The information provided in each column is as follows:

(1) Technical service. This column lists the basic number of the technical service assigned supply responsibility for the part. Those spaces left blank denote Corps of Engineers supply responsibility. General Engineer supply parts are identified by the letters "GE" in parentheses, following the nomenclature in the description column. Other technical services basic numbers are:

3—Chemical Corps  
9—Ordnance Corps  
10—Quartermaster Corps  
12—Adjutant General's Corps

(2) Source. The selection status and source of supply for each part are indicated by one of the following code symbols:

(a) P—applied to high-mortality repair parts which are stocked in or supplied from the technical service depot system, and authorized for use at indicated maintenance echelons.

(b) P1—applied to repair parts which are low-mortality parts, stocked in or supplied from technical service depots, and authorized for installation at indicated maintenance echelons.

(3) Maintenance. The lowest maintenance echelon authorized to use, stock, install, or manufacture the part is indicated by the following code symbol:

O—Organizational Maintenance (1st and 2d Echelon)

b. Federal Stock Numbers. When a Federal stock number is available for a part, it will be shown in this column and used for requisitioning purposes.

c. Description.

(1) The item name and a brief description of the part are shown.

(2) A five-digit Federal supply code for manufacturers and/or other technical services is shown in parentheses followed by the manufacturer's part number. This number will be used for requisitioning purposes when no Federal stock number is indicated in the Federal Stock Number column.

Example: (28265) 297108S

(3) The letters "GE" shown in parentheses immediately following the description indicate General Engineer supply responsibility for the part.

d. Unit of Issue. Where no abbreviation is shown in this column, the unit of issue is "each".

e. Expendability. Those items classified as nonexpendable are indicated by letters "NX". Items not indicated by "NX" are expendable.

f. Quantity Authorized. This column lists the quantities of repair parts, accessories, tools, or publications authorized for issue to the equipment operator or crew as required.

g. Quantity Issued With Equipment. This column lists the quantities of repair parts, accessories, tools, or publications that are initially issued with each item of equipment. Those indicated by an asterisk are to be requisitioned through normal supply channels as required.

h. Illustrations. This column is subdivided into two columns which provide the following information:

(1) Figure number. Provides the identifying number of the illustration.

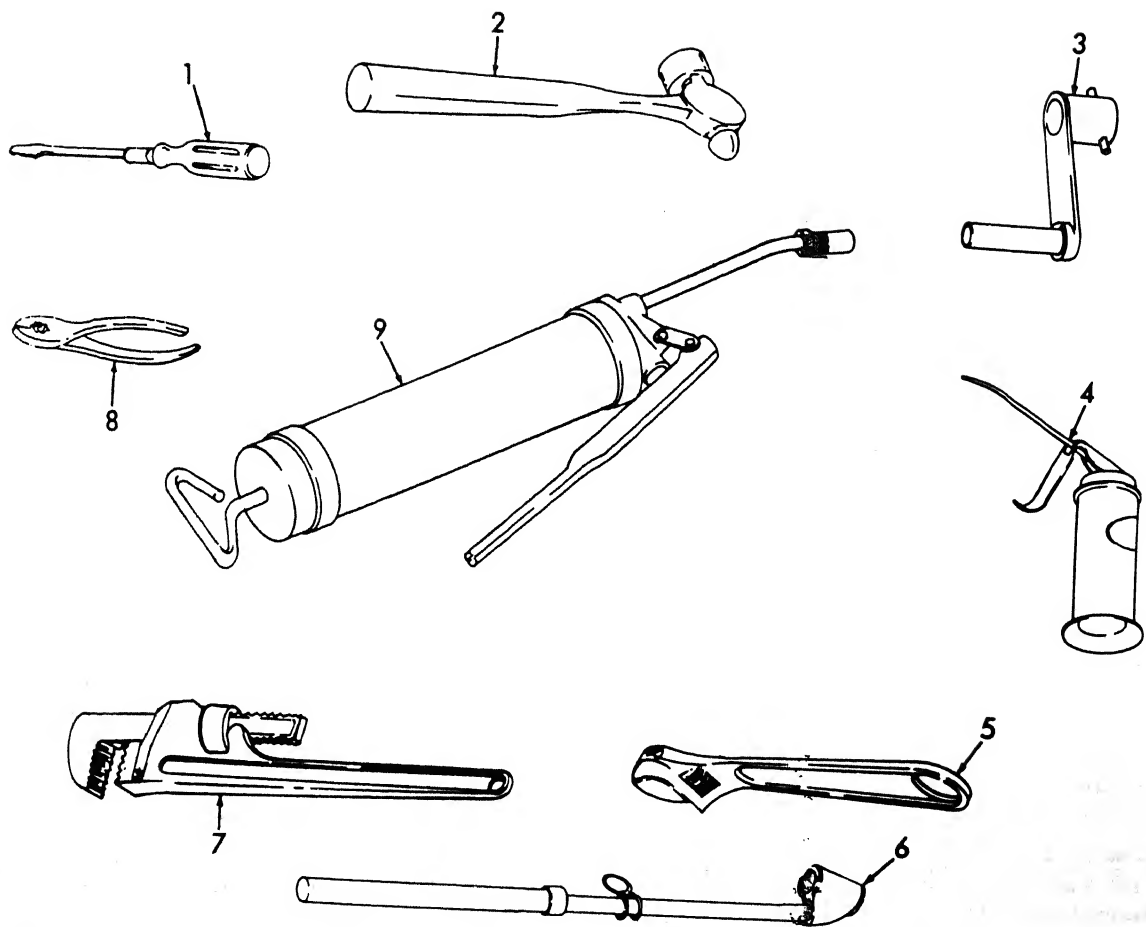
(2) Item number. Provides the referenced number for the part shown in the illustration.

3. INDEX TO FEDERAL SUPPLY CODE FOR MANUFACTURERS

28265—Hercules Engine Division of Hupp Corporation

4. COMMENTS AND SUGGESTIONS

Suggestions and recommendations for changes to the Basic Issue Items List will be submitted on DA Form 2028 to the Commanding Officer, U. S. Army Engineer Maintenance Center, ATTN: EMCDM-S P. O. Box 119, Columbus 16, Ohio. Direct communication is authorized.



EMC 3895-221-15/59

Figure 59. BASIC ISSUE ITEMS.



# **APPENDIX III** **Section II. BASIC ITEMS LIST**

Technical service	Source codes			Federal stock No.	Description	Unit of issue	Expendability	Quantity authorized	Quantity issued with equipment	Illustration	
	Source	Maintenance	Recoverability							Fig.	Item
					<b>GROUP 01—ENGINE</b>						
					<i>0111.1—HAND CRANKING DEVICES</i>						
	<b>X2</b>	<b>O</b>	----		----- CRANK, HAND: (28265) 29710BS-	----	----	1	1	59	3
					<b>GROUP 06—ELECTRICAL SYSTEM (ENGINE AND VEHICULAR).</b>						
					<i>0612—BATTERIES</i>						
9	<b>P</b>	<b>O</b>	----	6140-057-2553	BATTERY: 12 volt-----			2	2		
3	<b>P</b>	<b>O</b>	----	6810-264-9063	SULPHURIC ACID: electrolyte---	GAL	<b>NX</b>	2	2		
					<b>GROUP 26—ACCESSORIES, PUBLICATIONS, TEST EQUIPMENT AND TOOLS.</b>						
					<i>2602.1—ACCESSORIES</i>						
10	<b>P1</b>	<b>O</b>	----	7520-559-9618	CASE: Maintenance and Operational Manuals, cotton duck, olive drab, mildew resistant, water repellent MIL-B-11743.			1	1		
					<i>2602.2—COMMON TOOLS</i>						
10	<b>P</b>	<b>O</b>	----	5120-223-7396	PLIERS: slip joint, straight nose, combination w/cutter, 6 in. lg.			1	*	59	8
10	<b>P</b>	<b>O</b>	----	5120-234-8910	SCREWDRIVER: flat tip, plastic handle, 5/16 in. width tip 6 in. lg.			1	*	59	1
10	<b>P</b>	<b>O</b>	----	5120-243-2963	HAMMER, HAND: machinist's ball peen.			1	*	59	2
10	<b>P</b>	<b>O</b>	----	5120-264-3796	WRENCH, OPENED, ADJUSTABLE: single head type 0 to 1.322 in. opening 12 in. lg.			1	*	59	5
10	<b>P</b>	<b>O</b>	----	4930-360-2801	GREASE GUN, HAND: lever operated 16 ounce capacity, extension 7 in. lg and hydraulic coupler MIL-G-3859.			1	*	59	9
0	<b>P</b>	<b>O</b>	----	4930-273-3644	OILER, HAND: 8 ounce capacity, force fed, w/rigid spout, 6 in. lg.			1	*	59	4
0	<b>P</b>	<b>O</b>	----	5120-277-1479	WRENCH, PIPE: adjustable jaw style, stillson pattern 18 in. lg.			1	*	59	7
0	<b>P</b>	<b>O</b>	----	4910-273-3662	GAGE, TIRE: 10 to 160 pounds---			1	*	59	6

Technical service	Source codes			Federal stock No.	Description	Unit of issue	Expendability	Quantity authorized	Quantity issued with equipment	Illustration	
	Source	Maintenance	Recoverability							Fig.	Item
12	-----	-----	-----	-----	2602.4—PUBLICATIONS DEPARTMENT OF THE ARMY LUBRICATION ORDER LO 5-3895-221-15.	----	----	1	1		
12	-----	-----	-----	-----	DEPARTMENT OF THE ARMY OPERATOR, ORGANIZATIONAL, FIELD, AND DEPOT MAINTENANCE MANUAL TM 5-3895-221-15.	----	----	2	2		
12	-----	-----	-----	-----	DEPARTMENT OF THE ARMY ORGANIZATION, MAINTENANCE REPAIR PARTS AND SPECIAL TOOL LISTS TM 5-3895-221-20P.	----	----	2	2		
	P1	O	----	4210-555-8837	GROUP 76—FIRE FIGHTING EQUIPMENT.  7603—FIRE EXTINGUISHERS EXTINGUISHER, FIRE, MONOBROMOTRIFLUOROMETHANE: charged, hand-shatterable cylinder, penetrating seal valve, stored pressure, w/ bracket, 2.75 lbs (Halon-1301) MIL-Spec E-52031 (GE).	----	----	1	1		

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BY ORDER OF THE SECRETARY OF THE ARMY:

Official:

J. C. LAMBERT,  
Major General, United States Army,  
The Adjutant General.

G. H. DECKER,  
General, United States Army,  
Chief of Staff.

Distribution:

Active Army:

USASA (2)  
DCSLOG (1)  
CNGB (1)  
Tech Stf, DA (1) except  
CofEngrs (3)  
Army Maint Bd (1)  
USCONARC (3)  
USAARTYBD (2)  
USAARMBD (2)  
USAIB (2)  
USARADBD (2)  
USA Abn, Elct, & SPWAR Bd (2)  
USAAVNBD (2)  
ARADCOM (2)  
ARADCOM Rgn (2)  
OS Maj Comd (5) except  
USASETAF (2)  
USARJ (10)  
MDW (1)  
Armies (2)  
Corps (2)  
Div (2)  
Engr Bde (2)  
Svc Colleges (1)  
Br Svc Sch (2) except  
USAES (100)  
USMA (2)  
GENDEP (2) except  
Schenectady GENDEP (4)  
Atlanta GENDEP (4)  
Utah GENDEP (4)  
Memphis GENDEP (4)  
Sharpe GENDEP (4)  
Engr Sec, GENDEP (10)  
Engr Dep (10) except  
Granite City Engr Dep (14)  
OSA (2)  
Engr Dist (2) except  
Buffalo Engr Dist (1)  
Chicago Engr Dist (1)  
Detroit Engr Dist (1)  
Alaska Engr Dist (1)  
Los Angeles Engr Dist (1)  
New Orleans Engr Dist (1)  
New York Engr Dist (1)  
Louisville Engr Dist (1)  
Pittsburgh Engr Dist (1)

NG: State AG (3).

USAR: Units—same as Active Army except allowance is one copy for each unit.  
For explanation of abbreviations used, see AR 320-50.

San Francisco Engr Dist (1)  
Omaha Engr Dist (1)  
Seattle Engr Dist (1)  
Kansas City Engr Dist (1)  
Baltimore Engr Dist (1)  
Ft Worth Engr Dist (1)  
Eastern Ocean Engr Dist (1)  
Philadelphia Engr Dist (1)  
Rock Island Engr Dist (1)  
St Louis Engr Dist (1)  
St Paul Engr Dist (1)  
Div Engr Dist (2) except  
Lower Miss Valley Div Engr (none)  
North Central Div Engr (none)  
Engr Fld Maint Shops (2)  
Engr Dep Maint Shops (2)  
USAERDL (3)  
Engr Cen (5)  
AMS (3)  
USA Engr Proc Ofc (10)  
EMC (26)  
ESCO (10)  
Fld Comd, DASA (8)  
Def Log Svc Cen (1)  
USACOMZEUR (2)  
USAREUR Engr Sup Con Agcy (10)  
USAREUR Engr Proc Cen (2)  
USA Corps (1)  
MAAG (1)  
JBUSMC (1)  
USA Trans Tml Comd (2)  
Army Tml (2)  
Units org under fol TOE:  
5-48 (2)  
5-54 (2)  
5-115 (2)  
5-117 (2)  
5-118 (2)  
5-129 (2)  
5-237 (5)  
5-262 (5)  
5-267 (1)  
5-278 (5)  
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5-500 (EA, EB, HF, HG) (2)  
19-256 (2)  
55-500 (EL) (2)

